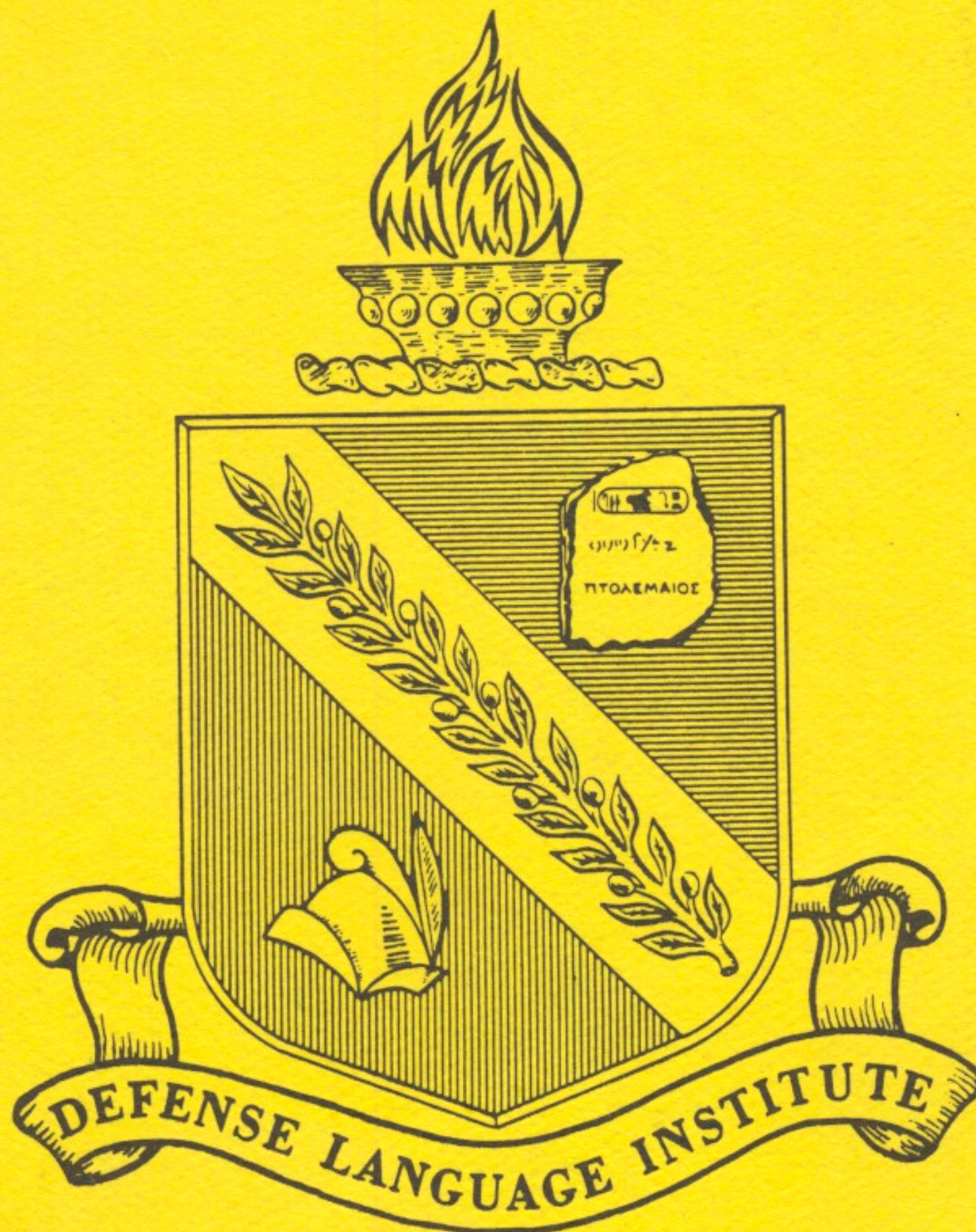


02RU37

May 1976



RUSSIAN

AURAL COMPREHENSION
COURSE

RADIO PROCEDURES

THIS PUBLICATION IS TO BE USED PRIMARILY IN SUPPORT OF
TRAINING MILITARY PERSONNEL AS PART OF THE DEFENSE
LANGUAGE PROGRAM (RESIDENT AND NONRESIDENT). INQUIRIES
CONCERNING THE USE OF THESE MATERIALS, INCLUDING REQUESTS
FOR COPIES, SHOULD BE ADDRESSED TO:

DEFENSE LANGUAGE INSTITUTE
NONRESIDENT OPERATIONS DIVISION
PRESIDIO OF MONTEREY, CA 93940

TABLE OF CONTENTS

Preface	11
Radio Equipment	1
Radio Communications	3
R U S S I A N	
Aural Comprehension Course	
Establishing Radiotelephone Communications	11
Signal Readability and Timing	17
Power Sources	19
Reference text. It is designed to introduce the student	12
to radio procedures at the most basic level. This supply-	27
Radio Traffic	27
mental technical material is general in nature in keeping	29
Copy Messages	29
with this phase of language training (13th - 19th week).	43
Message Receiving	43
The student will be given a reading assignment	53
RADIO PROCEDURES	
The Radio Procedures will introduce you to	53
aspects of radio procedures. This material will be further	53
developed in the daily Radio Communications Exercises. The	53
RCE will be transcribed or hand-copied as required during	53
the RCE laboratory hour.	53
Air Force Communications	53
Naval Communications	56
Tactical Radiotelephone Communications	59
Appendix A	64
MAY 1976	
Appendix B	67
Appendix C	69
DEFENSE LANGUAGE INSTITUTE	
Appendix D	71
Appendix E	74
Vocabulary	75
PRESIDIO OF MONTEREY, CA	

PREFACE

This handbook is intended for use by students of the Russian Aural Comprehension Course as a home study and reference text. It is designed to introduce the student to radio procedures at the most basic level. This supplemental technical material is general in nature in keeping with this phase of language training (13th - 19th week).

The student will be given a reading assignment from the Radio Procedures Handbook which will introduce various aspects of radio procedures. This material will be further developed in the daily Radio Communications Exercise. The RCE will be transcribed or hand-copied as required during the RCE laboratory hour.

TABLE OF CONTENTS

Preface	ii
Radio Equipment	1
Radio Communications	5
Establishing Radiotelephone Communications	11
Signal Readability and Tuning	17
Power Sources	19
Antennas	21
Radio Traffic	27
Copying Messages	29
Message Receipting	34
Message Routing	35
Sign Down	36
Changing Frequency	37
Wire Communications	42
Station Operation	47
Air Force Communications	53
Naval Communications	56
Tactical Radiotelephone Communications	59
Appendix A	64
Appendix B	67
Appendix C	69
Appendix D	71
Appendix E	74
Vocabulary	76

RCE READING ASSIGNMENTS

RCE #1-Preface, Radio Equipment, Radio Communications, Establishing Radio-telephone Communications	ii-16
RCE #2-Signal Readability and Tuning, Power Sources	17-20
RCE #3-Antennas, Radio Traffic	21-28
RCE #4, 5, 6, 7-Copying Messages	29-33
RCE #8-Message Receipting	34
RCE #9-Message Routing, Sign Down	35-36
RCE #10, 11-Changing Frequency	37-41
RCE #12, 13-Wire Communications	42-46
RCE #14-Station Operation	47-52
RCE #15-Air Force Communications	53-55
RCE #16, 17-Naval Communications	56-58
RCE #18, 19, 20-Tactical Radiotelephone Communications	59-63

Appendix A

Appendix B

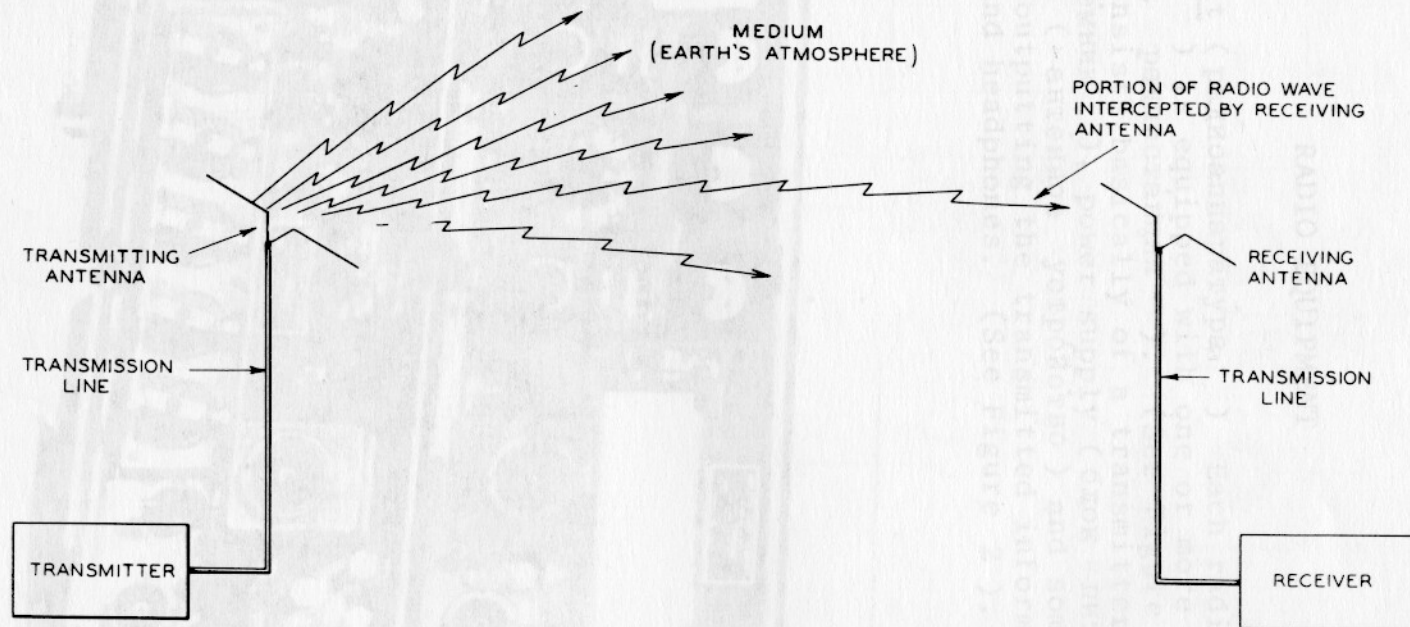
Appendix C

Appendix D

Appendix E

Vocabulary

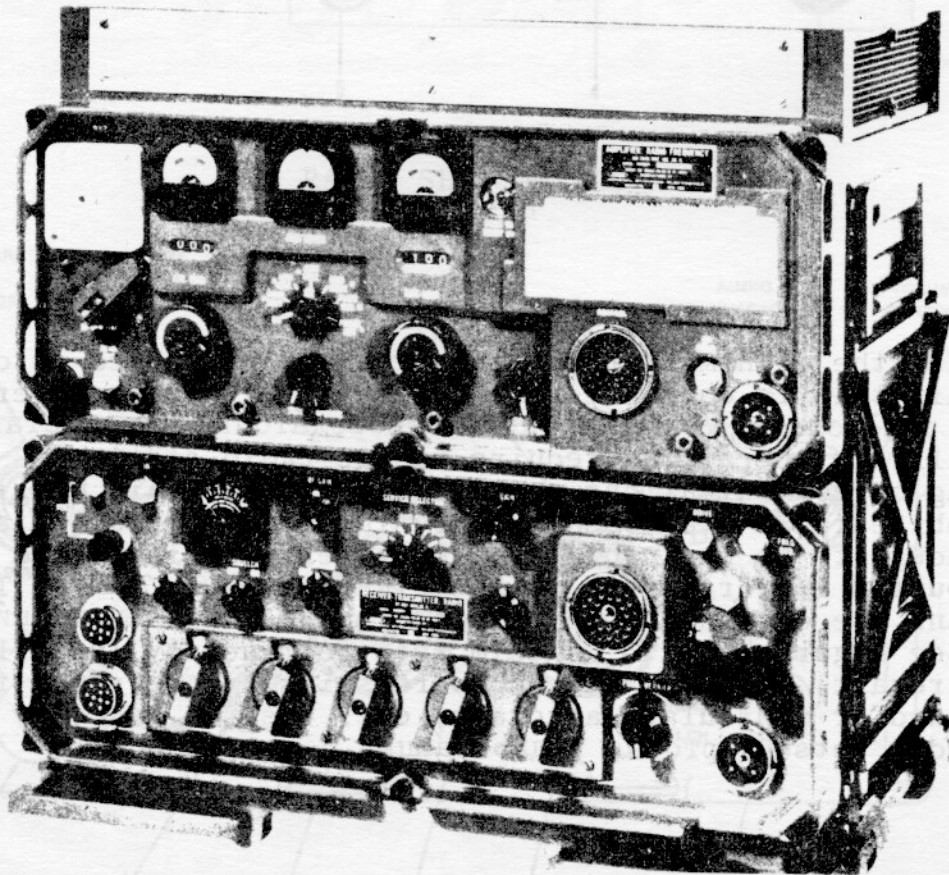
SIMPLE RADIO COMMUNICATIONS LINK



FM24-18-1-23

RADIO EQUIPMENT

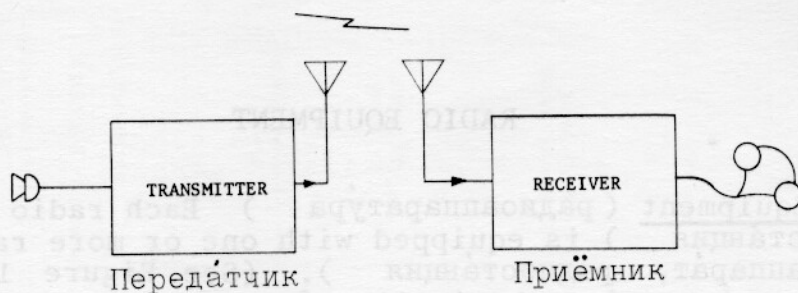
Radio Equipment (радиоаппаратура) Each radio station (радиостанция) is equipped with one or more radio sets (радиоаппарат, радиостанция). (See Figure 1). A radio set consists basically of a transmitter (передатчик), receiver (приёмник), power supply (блок питания), and antenna system (антенное устройство) and some means of inputting and outputting the transmitted information such as a microphone and headphones. (See Figure 2).



ПРИЕМОПЕРЕДАТЧИК

RADIO SET
TRANSCIVER

Figure 1

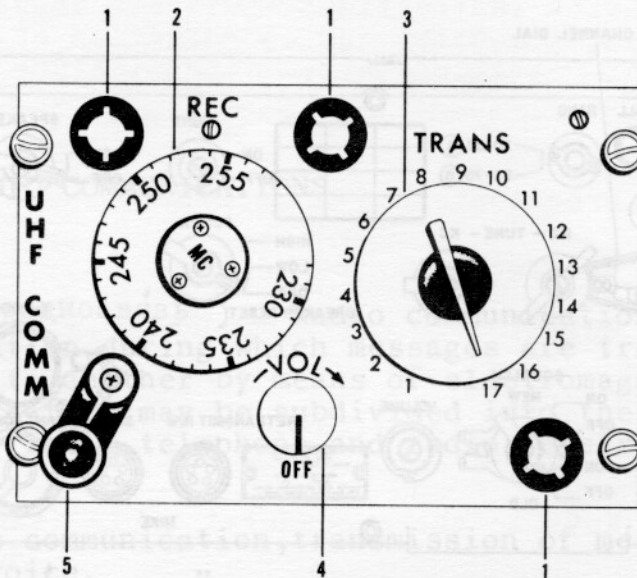


BLOCK DIAGRAM OF BASIC RADIO SET

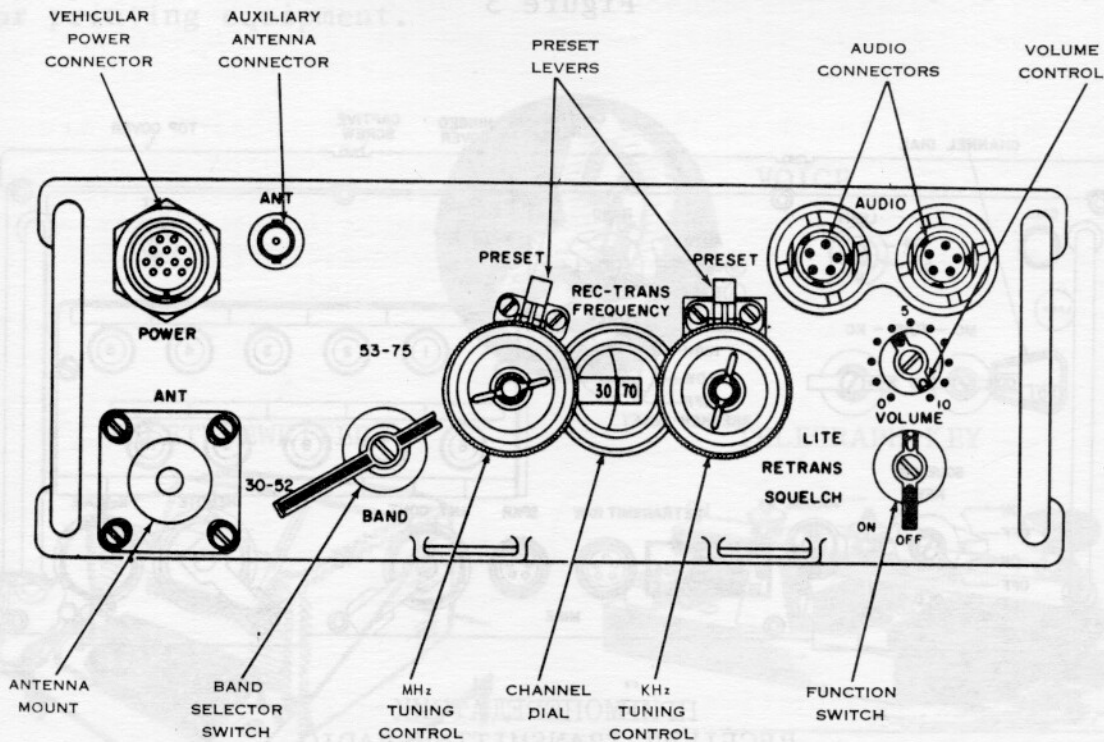
Figure 2

When the transmitter and receiver are assembled as one unit this is commonly referred to as a "transceiver" (приёмопередатчик или приёмо-передаточная радиостанция). Military operations require mobile radio stations. Depending on communications requirements and terrain considerations, mobile radio stations may vary in size from radios small enough to be backpacked to relatively sophisticated equipment mounted in large vans. (See Figures 3-6, 27-29) These vans are called communications vans (аппаратная машина связи) (See Figures 30 & 31). Radio sets permanently installed in aircraft, vehicles and on board ships are referred to as on-board or vehicular, aircraft, etc. (as the case may be) radio sets (бортовая радиостанция)

1. PANEL EDGE LIGHT
2. FREQUENCY DIAL
3. TRANSMITTER CHANNEL SELECTOR SWITCH
4. VOLUME CONTROL KNOB
5. TUNING CRANK

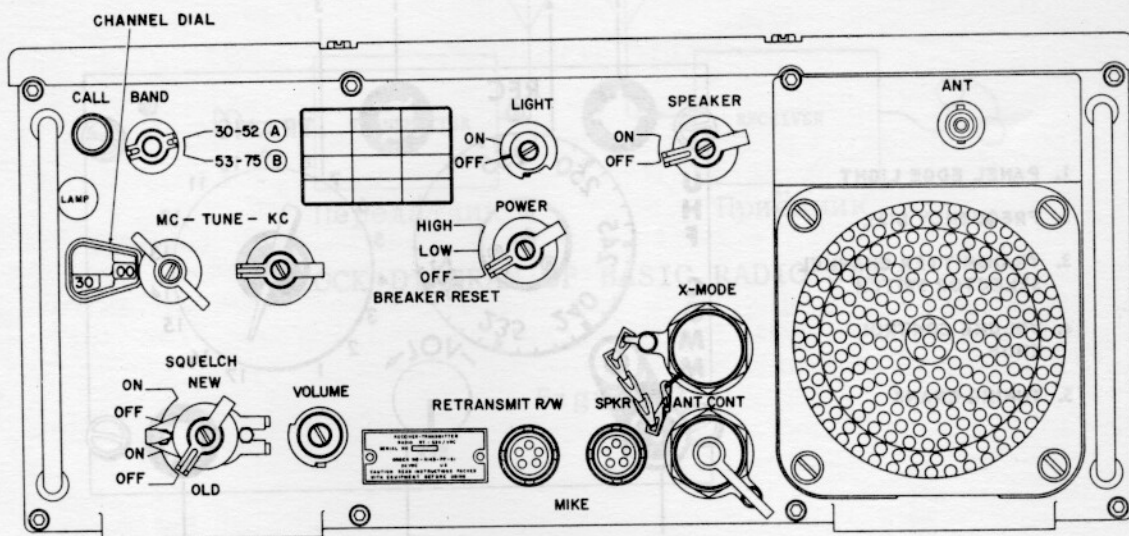


RADIO SET CONTROL
Figure 3



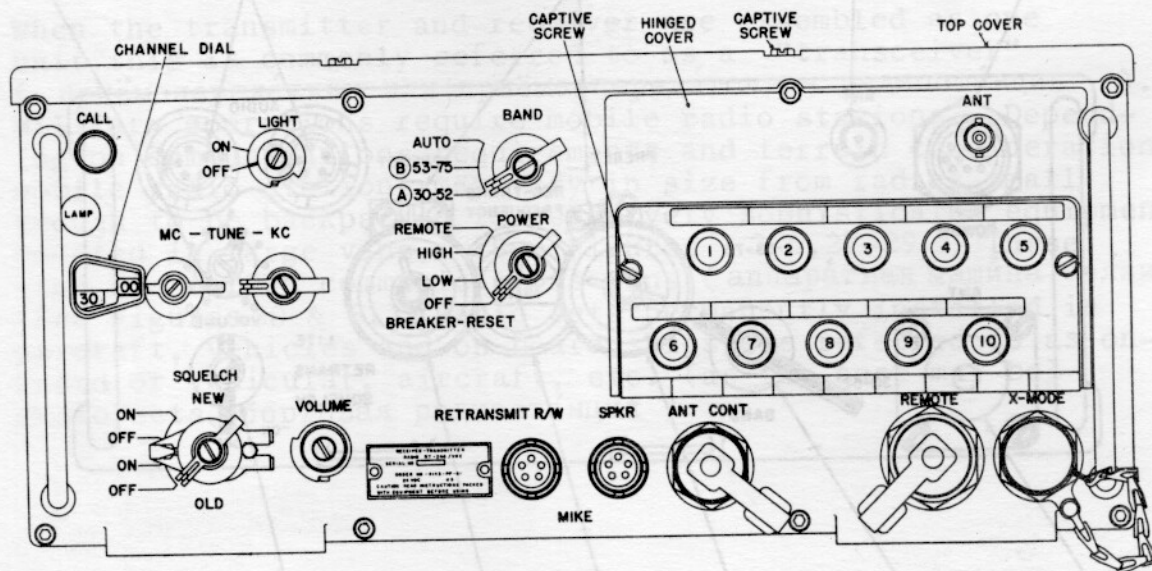
RADIO SET CONTROL PANEL

Figure 4



ПРИЕМОПЕРЕДАТЧИК
RECEIVER-TRANSMITTER
CONTROL PANEL

Figure 5



ПРИЕМОПЕРЕДАТЧИК
RECEIVER-TRANSMITTER RADIO

Figure 6

RADIO COMMUNICATIONS

Radio Communication (радиосвязь) - Radio communication is that type of communication during which messages are transmitted from one point to another by means of electromagnetic energy. Radio communication may be subdivided into the following categories: radio telephone and radio telegraph.

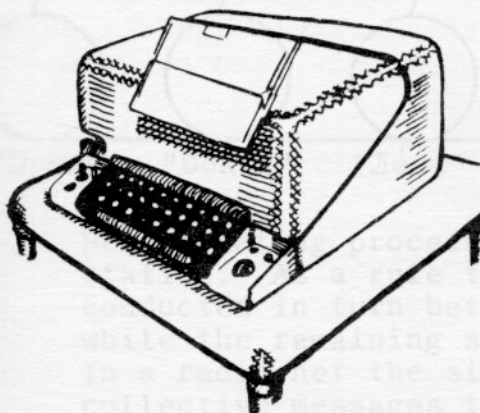
During radio telephone communication, transmission of messages is conducted by voice.

During radiotelegraph communication, messages are transmitted by special symbols (codes) with the aid of a telegraph key or printing equipment.

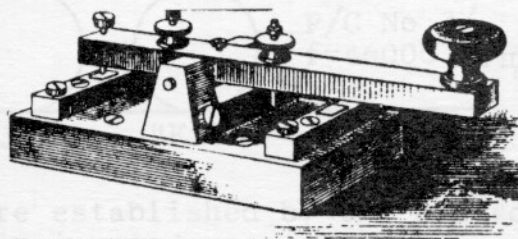


VOICE

TELETYPEWRITER



TELEGRAPH KEY



Signal Operation Instructions (радиоданные) - Signal Operation Instructions (SOI) are issued to radiostations for technical control and coordination of radio communication. Signal Operation Instructions include the following information:

Frequencies (частоты)

Call signs (позывные)

Azimuths to correspondents (азимуты на корреспондентов)

Radio authenticators (радиопароли)

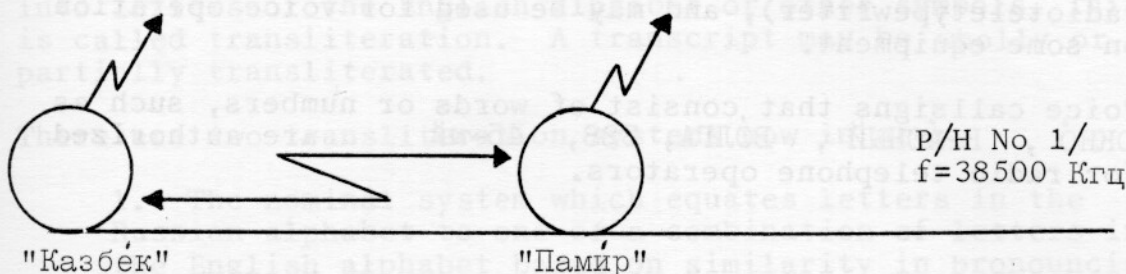
Keys to the procedural table (ключи к переговорной таблице)

Instructions on radio station operating procedures
(указание о порядке работы радиостанции)

The SOI are issued to the radio station by receipt, or are written in the radio station log (аппаратный журнал радиостанции). The SOI may be written on the front panel of portable radio sets. Signal Operation Instructions are issued for a definite period of use, upon expiration of which, they are withdrawn and new SOI issued.

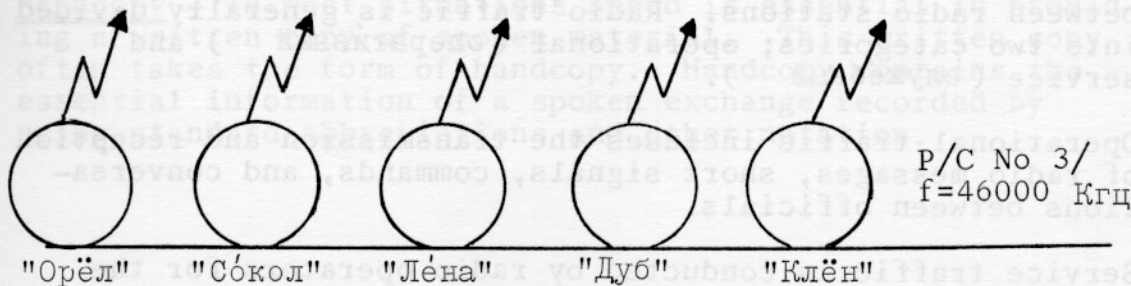
Organization of Radio Communication - The two basic methods of organizing radio communications are the radio link and the radio net.

Radio link (радионаправление) - A radio link is that method of organizing radio communication between two radio stations using signal operating instructions assigned to that link.



The radio station of the senior commander is the control station. The control station (главная радиостанция) monitors the observance of communications discipline by correspondents and all orders (instructions) of the control station must be carried out immediately.

Radio net (радиосеть) - A radio net is that method of organizing radio communication between three or more radio stations using signal operating instructions assigned to this net.



Net operating procedures are established by the control station. As a rule transmission and reception are conducted in turn between a pair of radio stations while the remaining stations of the net are on standby. In a radio net the simultaneous transmission of collective messages to a large number of correspondents is possible.

Call signs (Позывные) - Call signs are used primarily for establishing and maintaining communications. They consist of any combination of characters or pronounceable words that identify a communication facility, a command, an authority, or a unit. Periodic changing of call signs provides communication security for a brief period.

Call signs that consist of four characters, such as КВММ or ЛДНП, are authorized for radiotelegraph (including radioteletypewriter), and may be used for voice operation on some equipment.

Voice call signs that consist of words or numbers, such as ОКНО, КРАСНЫЙ, ВОЛГА, 328, 45-ый are authorized for radio telephone operators.

Radio authenticators (радиопароли) - Radio authenticators are a security measure designed to protect a communications system against fraudulent transmissions. There are many circumstances in which authentication must be used, depending upon the needs or desires of each command. Authentication tables are contained in the SOI.

The authentication procedure consists of a challenge (ПАРОЛЬ) and reply (ОТЗЫВ). The station requesting authentication gives the challenge in the form of a number or letter and the challenged station gives the appropriate reply from the authentication table.

Radio Traffic (радиообмен или "нагрузка") - Radio traffic is the transmission and reception of messages (information) between radio stations. Radio traffic is generally divided into two categories; operational (оперативный) and service (служебный).

Operational traffic includes the transmission and reception of radio messages, short signals, commands, and conversations between officials.

Service traffic is conducted by radio operators for the purpose of establishing radio communication, adjusting or tuning radio channels, and clearing up various questions connected with the transmission and reception of operational traffic.

Transcription - Transcription is the writing or converting into written form of spoken material. This is most commonly done in Russian using the Cyrillic script (Russian alphabet) and following certain format procedures. The resulting formatted document with text is called a transcript.

Transliteration - For certain technical reasons it may be necessary to convert the letters of the Russian alphabet into letters of the English alphabet or other symbols. This is called transliteration. A transcript may be wholly or partially transliterated.

There are two transliteration systems now in use:

1. The nominal system which equates letters in the Russian alphabet to one or a combination of letters in the English alphabet based on similarity in pronunciation or symbols.
2. The technical system which equates letters of the Russian alphabet to one letter in the English alphabet or symbol (punctuation mark) based on an arbitrary system.

These systems may not be mixed when transliterating. Note that certain letters/characters occur in both systems but that they equate to a different Russian letter. Also note that in the nominal system where letter combinations are used, only the first letter of the combination is capitalized, the following letters being lower case. This is done in order to avoid confusion by setting apart this combination as equating to only one letter of the Russian alphabet.

Handcopy - In most situations speed is essential in providing a written copy of spoken material. This written copy often takes the form of handcopy. Handcopy contains the essential information of a spoken exchange recorded by using standard abbreviations and other notation.

Abbreviated Callsigns - It takes too much time to write out word callsigns in the TO and FM columns each time they are mentioned, so they are abbreviated by using the first three letters of the callsign. For example, Kpachm would be abbreviated to Kpa, Cokme to Cok, etc. Note, however, that word callsigns will be encountered from time to time as part of the text, and in this case they are written out in their entirety. Abbreviations are used only in the TO and FM columns.

Pronunciation of Letters and Numerals - To avoid confusion and errors during voice transmissions, special procedures have been developed for pronouncing letters and numerals. These special procedures are the phonetic alphabet and numerical nouns.

The phonetic alphabet is used by the operator to spell difficult words and thereby prevent misunderstanding on the part of the receiving operator. The words of the phonetic alphabet, which is a word alphabet and not a code, are pronounced as shown in Charts 1 & 2 Appendix D. There are two systems of phonetic alphabets now in use. Chart 1 shows the system used by all branches of the Armed Forces with the exception of the Navy. It is based on Russian proper names. Chart 2 shows the system used by the Navy. It is based on the old Slavonic alphabet.

The phonetic alphabet is also used for the transmission of encrypted messages. For example, the cipher group АНОХИ is spoken "Анна, Никола́й, Ольга, Харито́н, Ива́н".

You should already be familiar with numerical nouns. They are used quite extensively in radio communication when giving readability indications, tuning counts, when transmitting callsigns or number groups in which there is a series of the same digit, and when readability is poor.

ESTABLISHING RADIOTELEPHONE COMMUNICATIONS

Callsign The Russian word for callsign is позывной, which is an adjectival noun. A callsign is used to designate a specific radio station, which may be an aircraft, a ship, or a mobile or permanent ground station. In Soviet radio communications, a callsign may be one of the following:

- a. A noun. Examples: Окно́, Соба́ка, Со́лнце
- b. An adjective. Examples: Кра́сный, Све́тлый, Се́верный
- c. A geographical placename. Examples: Москва́, Во́лга, Ура́л (Note that a station using a geographical callsign is not necessarily located at that place.)
- d. A number, either ordinal or cardinal. Examples: 2-о́й, 328, 01, 45-ый, 2211, etc.
Numbers are also frequently used as suffixes to word callsigns. Examples: Со́лнце-68, Кра́сный-321, Во́лга-1

Communications Log Communications exchanges between radio stations are entered on a communications log, or communications record. In your transcription exercises you will use a form which looks like this:

TO	FM	TEXT

On this form, the callsign of the station being called is entered in the TO column; the callsign of the station which is calling is entered in the FM (From) column. All else that is said is written in the TEXT column.

Abbreviated Callsigns It takes too much time to write out word callsigns in the TO and FM columns each time they are mentioned, so they are abbreviated by using the first three letters of the callsign. For example, Кра́сный would be abbreviated to Кра, Со́лнце to Сол, etc. Note, however, that word callsigns will be encountered from time to time as part of the text, and in this case they are written out in their entirety. Abbreviations are used only in the TO and FM columns.

Number callsigns are transcribed using arabic numerals and are normally not abbreviated. Remember that ordinal number callsigns are written using arabic numerals plus appropriate adjectival ending. Examples: 57-ой, 850-ый, 3-ий

Word callsigns with numerical suffixes are entered in the TO and FM columns using the appropriate three-letter abbreviation plus the numerical suffix. For example, Стакан-742 would be abbreviated as Ста-742, Птица-4 as Пти-4, and so on.

Callsign Legend Most communications record forms include a callsign legend (marked C/S) at the top of the sheet. Normally, all callsigns - including numerical callsigns - encountered during a communications exchange are entered in the callsign legend. Word callsigns must be written out in full in the legend, and any abbreviations which were used in the TO and FM columns should be entered in the space to the right of the appropriate callsign. The legend will then show, for example, that the abbreviation Сак stands for the callsign Сахар, Обл for Облако, and so on.

Callsigns which were mentioned in the text but were never used in the TO and FM columns are still entered in the legend, but should have the notation 'in text only' written after them.

Following is an example of the Communications Log Legend showing how callsigns and their abbreviations are listed:

Красный	КРА	2211	
Красный-321	КРА-321	45371*	371
Волга	ВОЛ	МОСКВА	МОС
Волга-1	ВОЛ-1	ОРЕЛ	In Text Only
328		5-КА	
45-ый	45	1-ЦА	

*When abbreviating five- or six-digit callsigns, it is permissible to use either the first three or last three digits. Both methods are used and are valid.

Station Call-ups The most common use of callsigns is to contact other radio stations. This is typically done by one station calling the station or stations with whom he desires to communicate, identifying each station, including himself, by callsign. For example:

"Матро́с, я Зелёный. Как слы́шите меня́? Приём."

This call-up would be transcribed on the communications log as follows:

TO	FM	TEXT
Мат	Зел	Как слы́шите меня́? Приём.

NOTE: The word приём ("over" in English) should theoretically follow each and every transmission. However, in practice it is frequently omitted and therefore cannot be relied upon as a hard and fast rule.

Repeated Callsigns In any call-up, the callsigns may be repeated several times, depending on the whim of the radio operator. For example, you might hear:

"62-ой, 62-ой, 62-ой, я 20-ый, я 20-ый. Отвё́тите!"

This call-up would appear on your communications log as follows:

TO	FM	TEXT
62-ой	20-ый	Отвё́тите!

Note that in cases of repeated callsigns there is no need to write down the callsign on your communications log more than once.

Dropped Callsigns After the first call or two, the station making the call-up may drop his own callsign. For example, 20-ый may say:

"62-ой, как по́няли? Приём."

If the dropped callsign can be deduced with a reasonable degree of certainty, it should be entered in the appropriate column on your communications log. However, all such assumed, or implied, callsigns must always be enclosed in parentheses. For example, the above transmission would be transcribed in the following manner:

TO	FM	TEXT
62-ой	(20-ый)	Как по́няли? Приём.

However, if the missing callsign cannot be deduced with a reasonable degree of certainty, then a notation of three periods ... should be entered in place of the callsign. For example, if in the above transmission you were unsure as to who was calling, your communications log should look like this:

TO	FM	TEXT
62-ой	. . .	Как по́няли? Приём.

After a number of exchanges between the same people, operators sometimes drop both callsigns. For example, you might hear a conversation something like this:

"Инженёр, я Охотник. Как слы́шите меня́? Приём."
 "Я Инженёр. Слы́шу вас хоро́шо."
 "Вы что́-нибудь име́ете для меня́? Приём."
 "Нет, для вас ниче́го не име́ю."
 "Я Магази́н. Приём."
 "Я Магази́н. Отвеча́й мне!"
 "Что хоте́те? Я Инженёр."

When transcribed on your communications log, this conversation would look like this:

TO	FM	TEXT
Инж	Охо	Как слы́шите меня́? Приём.
(Охо)	Инж	Слы́шу вас хоро́шо.
(Инж)	(Охо)	Вы что́-нибудь име́ете для меня́? Приём.
(Охо)	(Инж)	Нет, для вас ниче́го не име́ю.
...	Маг	Приём.
...	Маг	Отвеча́й мне!
(Маг)	Инж	Что хоте́те?

Note that since Магази́н does not specify whom he is calling, we can make no callsign assumptions for those transmissions.

Reduced Callsigns Operators usually use full callsigns during initial call-ups. Later, however, they may use only part of the callsign. For example, Бумага-24 may be shortened to either Бумага or to 24 (or 24-ый). Such reduced callsigns are entered in the TO and FM columns as spoken, unless the full callsign can be reconstructed with a reasonable degree of certainty, in which case the dropped portion of the callsign may be entered in parentheses in the same manner as with implied callsigns. For example, if you know that Бумага-24 and Карандаш-61 are the two stations involved and you were to hear the following transmission:

"Бумага, я 61. Вы слышите меня, нет? Приём."

you may transcribe it as follows:

TO	FM	TEXT
Бум-(24)	(Кар)-61	Вы слышите меня, нет? Приём.

Of course, if you possessed insufficient data to reconstruct the full callsigns with a reasonable degree of accuracy, no assumptions could be made, and the transmission would have to be entered on your log exactly as given. For example:

TO	FM	TEXT
Бум	61	Вы слышите меня, нет? Приём.

Multiple Station Call-ups In the examples given so far, one station was calling one other station. A station can also call up several stations at the same time. For example:

"62-ой, 91-ый, 59-ый, я 20-ый. Приём."

20-ый has just called up three stations at one time. When transcribing such a multiple call-up, each station called should be entered on a separate line, with the calling station - and the text - on the last line. The above transmission would then look like this:

TO	FM	TEXT
62-ой		
91-ый		
59-ый	20-ый	Приём.

Collective Call-ups As seen above, if a station wants to talk to only one other station, he makes a single station call-up; if he wants to talk to several stations, he makes a multiple station call-up; if he wants to talk to all stations of a net, he makes an all-station, or collective, call-up. The word Всем (to all) may be used for this purpose. For example:

"Всем, всем. Я 20-ый. Имею радиогрámму."

On your communications log, it should look like this:

TO	FM	TEXT
Всем	20-ый	Имею радиогрámму.

Note that although the word "Всем" can be used in the TO-FM column, it should never be placed in the legend as a callsign.

Alternatively, a specific callsign may be set aside for use exclusively as a collective callsign, called in Russian циркулярный позывной. When this callsign is used, all stations of a net immediately understand that the following transmission is intended for all of them. A collective callsign is usually indistinguishable in form from other callsigns of a net, and therefore normally may only be recognized as a collective callsign by context. For example, you may hear:

"15-ый, 15-ый, 15-ый, я 20-ый. Имею радиогрámму для всех!"

The repetition of the callsign and the use of the phrase для всех are good indications that 15-ый is a collective callsign.

Even though a callsign may be recognized as a collective, it should in all cases be treated as a regular callsign for the purposes of transcription. The above transmission should then look like this when transcribed:

TO	FM	TEXT
15-ый	20-ый	Имею радиогрámму для всех.

Note also that even though a collective callsign does not represent a specific station, it should nonetheless be entered in the legend along with all other callsigns.

SIGNAL READABILITY AND TUNING

Readability After initial call-up, the stations usually determine the readability of each others' radio signals. Readability involves both strength and clarity. "To read" means to receive and understand. A loud signal that isn't clear enough is unreadable, just as a clear signal that isn't loud enough is unreadable. The ideal signal is both loud and clear.

Readability checks begin with the question "Как вы меня слышите?" or a variation thereof. Responses to this question indicate the degree of readability, and may be expressed in one of two ways:

a. By descriptive expressions:

1. Слышу вас отлично.
-I read you excellently.
2. Слышу вас хорошо.
-I read you well.
3. Слышу вас удовлетворительно.
-I read you satisfactorily.
4. Слышу вас слабо.
-I read you weakly.
5. Слышу вас плохо.
-I read you poorly.
6. Вас не слышу.
-I do not read you.

b. By use of a five-point number scale:

1. Слышу вас на пятерку (or на пять)
-I read you five-by-five (excellently).
2. Слышу вас на четверку (or на четыре)
-I read you four-by-five (well).
3. Слышу вас на тройку (or на три)
-I read you three-by-five (satisfactorily).
4. Слышу вас на двойку (or на два)
-I read you two-by-five (weakly).
5. Слышу вас на единицу (or на один)
-I read you one-by-five (poorly).

Note: The expressions 5-by-5, 4-by-5, etc. are usually shortened to simply 5-by, 4-by, etc. in US radio terminology.

Tuning If the readability is poor the radio operators will try to improve it. One of the operators may ask the other to give a tuning count (настройка). A настройка is simply a counting procedure, usually from one to five and back again (1-2-3-4-5, 5-4-3-2-1) or one to ten and back again (1-2-3-4-5-6-7-8-9-10, 10-9-8-7-6-5-4-3-2-1). However, the form of a tuning count may vary considerably, depending upon the whim of the individual radio operator. The one-to-five count and the one-to-ten count may be referred to as a short count and a long count, respectively. In Russian, the long count may be referred to as a длительная or продолжительная настройка. Also remember that Russians when counting almost always use the word раз in place of the number один, as for example: "раз-два-три..."

The purpose of a tuning count is to provide the operator at the other radio station with a continuous stream of sound so that he may tune in his receiver to the exact frequency for optimum readability.

Due to the stereotyped nature of tuning counts, it is a waste of time to transcribe them verbatim on your communications log. They are usually abbreviated to 1-5-1 or 1-10-1, or a similar form. Such abbreviations should, however, be enclosed in parentheses in your transcript. For example, if you hear the following transmission:

"Москва, я Волга. Даю настройку. Раз-два-три-четыре-
пять-шесть-семь-восемь-девять-десять, десять-девять-
восемь-семь-шесть-пять-четыре-три-два-один. Как
сейчас слышите?"

you would transcribe it as follows:

TO	FM	TEXT
Мос	Вол	Даю настройку.(1-10-1).Как сейчас слышите?

POWER SOURCES

Radio equipment requires electric power. This power may come from a variety of sources, such as power lines, dry batteries, storage batteries, engine-driven generators, and rectifiers. Each type has certain advantages and certain limitations.

Power lines (линии электропередачи или питающая сеть) Various values of alternating current (AC) (переменный ток) and direct current (DC) (постоянный ток) voltages can be obtained from power lines and used as primary power sources. Usually, power lines are available only in well developed areas, i.e. close to cities or towns. In rural areas or wilderness areas, radio stations are forced to rely on some portable source of electric power. Because of the wide variation in commercial power in various parts of the world, and because of the special power requirements of certain types of communication equipment, it is frequently necessary to make changes in the available power by means of various types of power converters.

Batteries Batteries can be used instead of powerlines or generators, especially in mobile operations.

Dry Batteries (сухая батарея) Dry batteries are especially adapted for use where small amounts of power are needed and portability is required. Normally they are used to supply power for field telephones, portable radio transmitters and receivers and other portable equipment. They are produced in various sizes and shapes, and in several capacities and voltages, to accommodate this wide range of uses.

Storage Batteries (аккумулятор или аккумуляторная батарея) Storage batteries provide a compact source of DC for operation of transportable (tactical) telephone exchanges and various radio transmitters and receivers. They are also used in vehicular ignition systems. Storage batteries must be recharged periodically by connecting them to an external power source, such as a generator or to the power lines, via a charging device. Storage batteries are usually much larger and heavier than dry batteries.

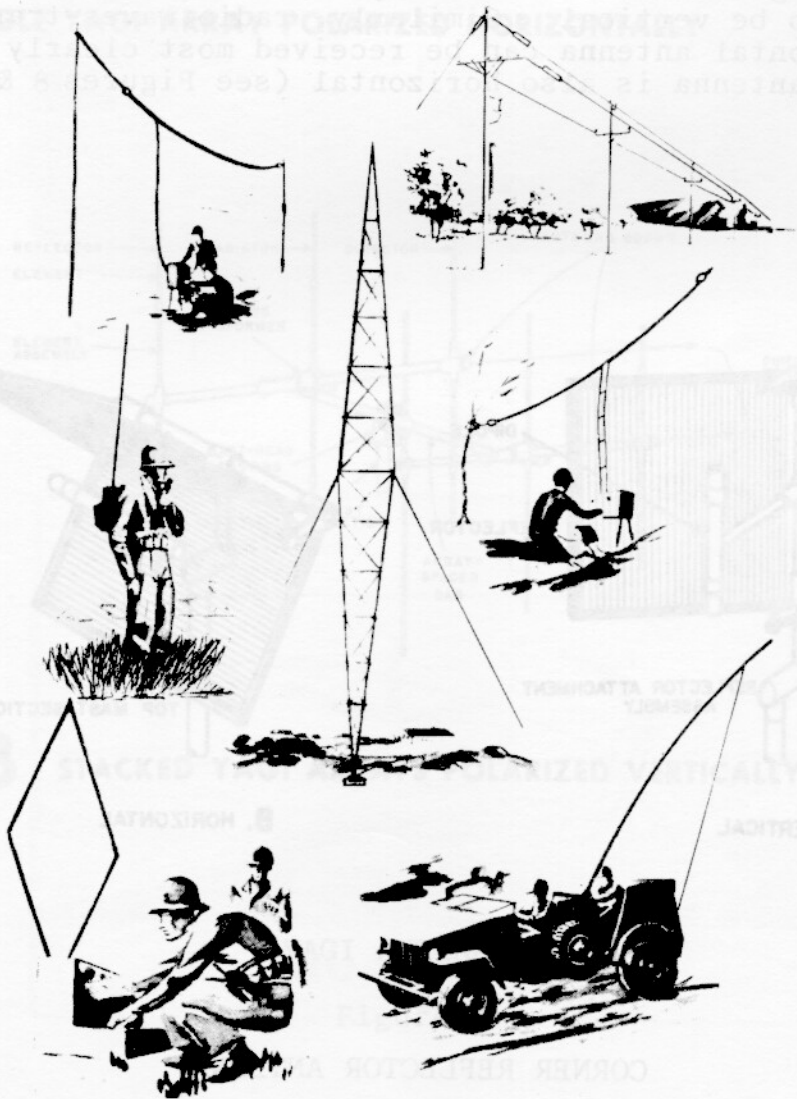
Engine-Driven Generators (двигатель - генератор)

Generators are used to produce electricity when power lines are not available, or as a backup in case power lines are knocked out. Most generators are driven by a diesel or gas engine. Generators may provide either AC or DC or both and can be adjusted within limits to produce the proper amount of current at the correct voltage.

Power supply (блок питания) Each radio set and radio station has as an integral part a power supply. This power supply basically consists of an interface or converter for one of the power sources mentioned above. The power supply converts the external source to values of voltage and current needed by the various internal components of the communications equipment.

ANTENNAS

Some form of antenna is necessary for radio transmitters and receivers to operate properly (see Figure 7). An antenna can both transmit and receive radio frequency energy. Some radio equipment uses both a transmitting and a receiving antenna, while most equipment uses one antenna for both functions. The function of a transmitting antenna is to convert the output power delivered by a radio transmitter into an electromagnetic field that is radiated through space. The receiving antenna makes the energy conversion in the opposite direction. For maximum efficiency, an antenna must be cut to the proper length, properly polarized and oriented.

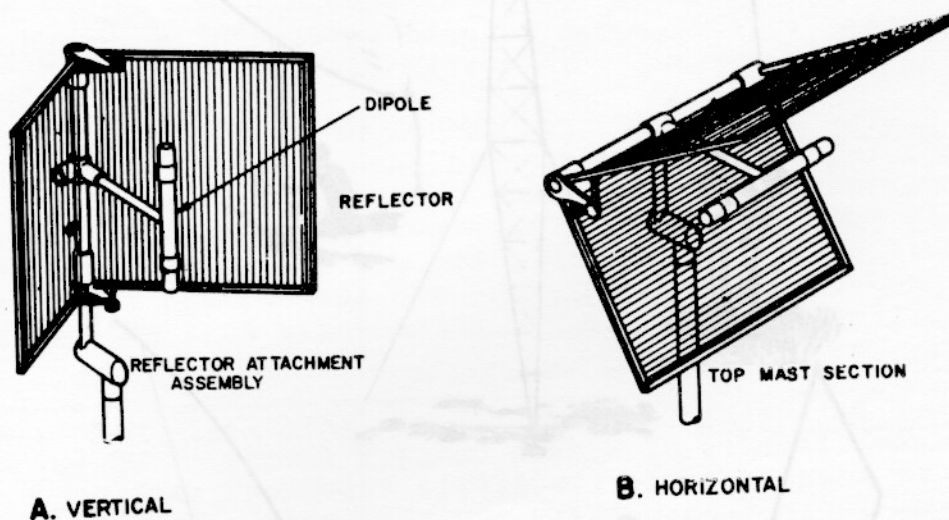


TYPES OF TRANSMITTING ANTENNAS

Figure 7

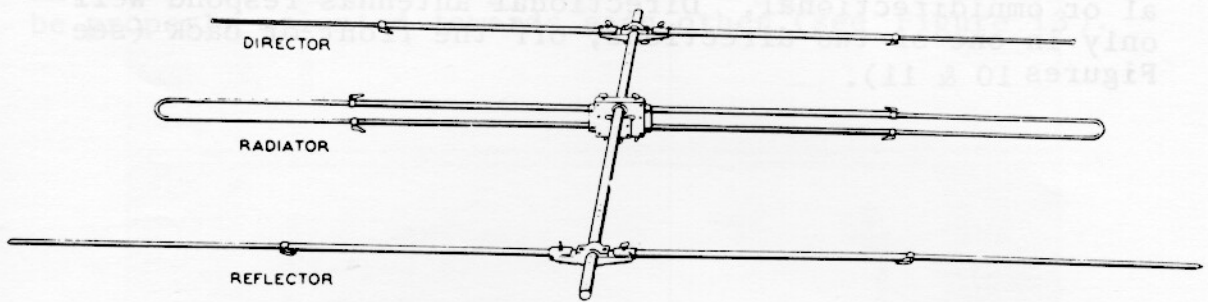
Length In order for antennas to function properly they must be cut to the proper length. A certain mathematical relationship must exist between the antenna and radio signals of a given frequency. In the case of the common quarter-wave antenna, the length is calculated by determining the wave length of a given frequency and dividing it by four.

Polarization (поляризация) Radio waves can be either vertically or horizontally polarized. A vertical antenna transmits or receives vertically polarized waves. If the transmitting antenna is vertical, the receiving antenna should also be vertical. Similarly, radio waves transmitted by a horizontal antenna can be received most clearly if the receiving antenna is also horizontal (see Figures 8 & 9).

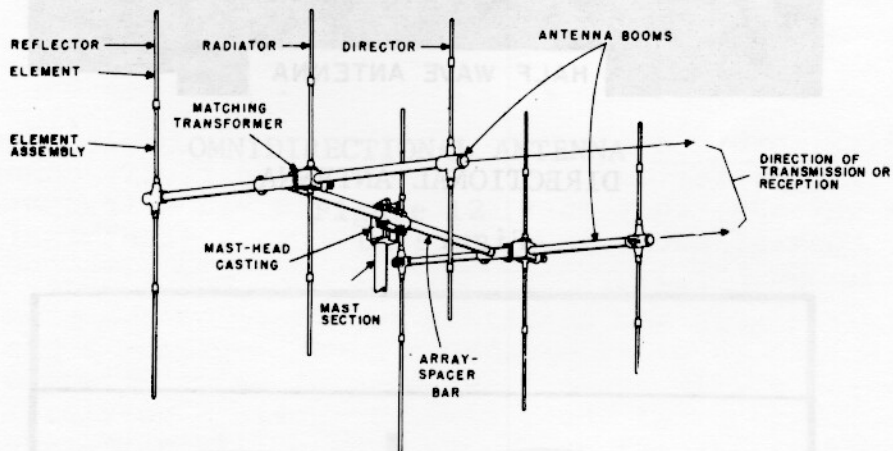


CORNER REFLECTOR ANTENNA

Figure 8



A SINGLE YAGI ARRAY POLARIZED HORIZONTALLY

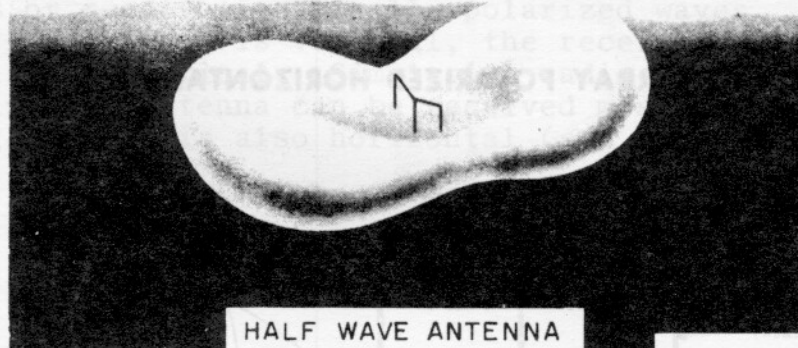


B STACKED YAGI ARRAYS POLARIZED VERTICALLY

YAGI ANTENNAS

Figure 9

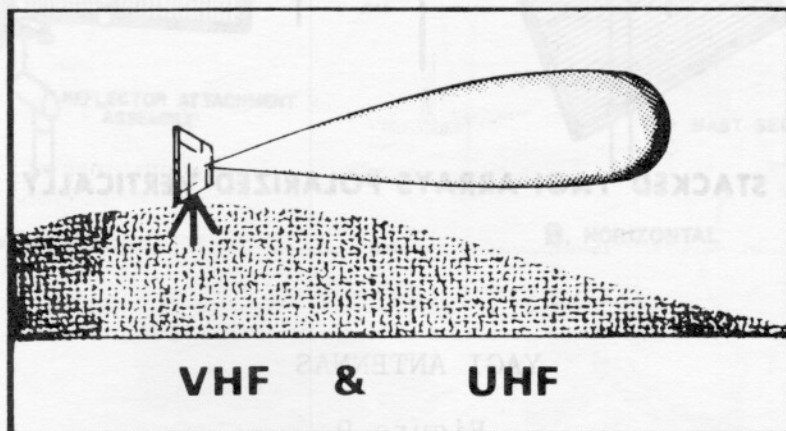
Directional and omnidirectional antennas (направленные и ненаправленные антенны) All antennas are either directional or omnidirectional. Directional antennas respond well only in one or two directions, off the front or back (see Figures 10 & 11).



HALF WAVE ANTENNA

DIRECTIONAL ANTENNA

Figure 10



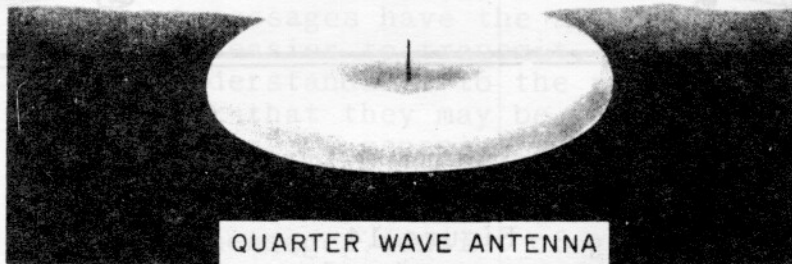
VHF & UHF

НАПРАВЛЕННАЯ АНТЕННА

DIRECTIONAL ANTENNA

Figure 11

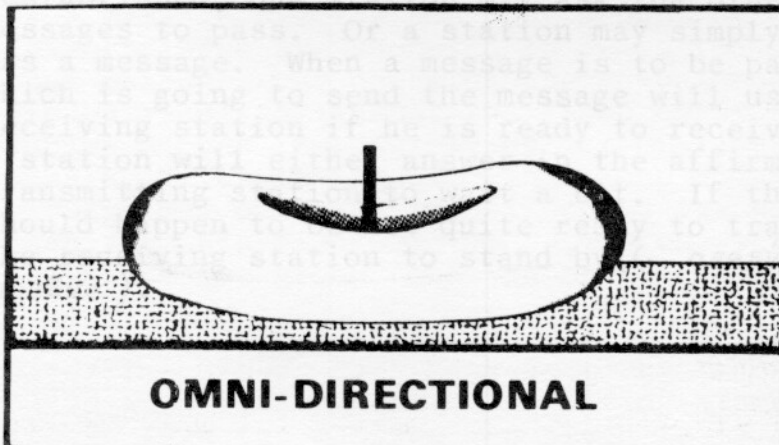
Omnidirectional antennas respond equally well in all directions (see Figures 12 & 13). Generally, horizontal antennas will be directional and vertical antennas will be omnidirectional, unless modified. When using directional antennas for transmitting and receiving, the antennas must be properly oriented towards each other (see Figure 13).



QUARTER WAVE ANTENNA

OMNIDIRECTIONAL ANTENNA

Figure 12

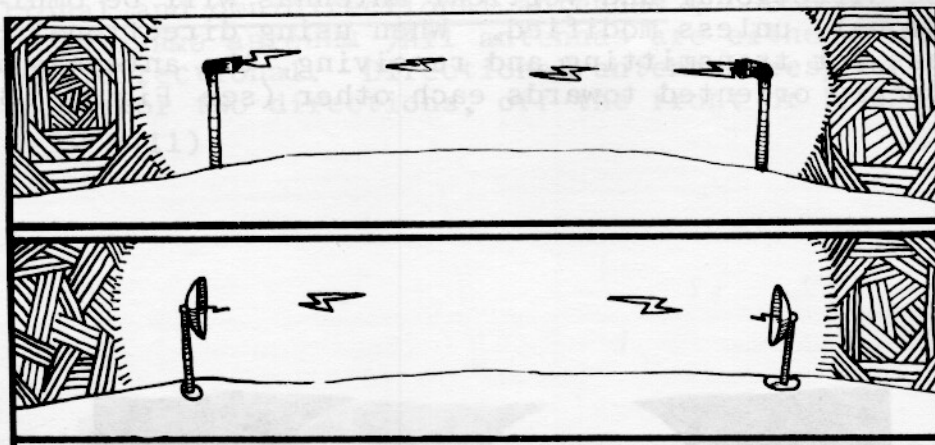


OMNI-DIRECTIONAL

НЕНАПРАВЛЕННАЯ АНТЕННА

OMNIDIRECTIONAL ANTENNA

Figure 13



ANTENNA ORIENTATION

. Figure 14

Transmission Lines (линия переда́чи или фидер) When the radio transmitter and receiver are not directly connected to the antenna, they must be connected via a transmission line. Coaxial cable is usually used as a transmission line (see Figure 7).

RADIO TRAFFIC

Radio Messages Messages are by far the most common form of radio traffic. In Russian a message is called a радиогрaмма or simply радио . It may also be abbreviated to РГ , or even РД (for радиодепeша - radio dispatch), or РДО .

Types of Messages Basically, messages may be either plaintext (plain language) or encrypted.

- a. Plaintext messages have the advantages of being faster and easier to transmit, as well as being readily understandable to the recipient. But due to the fact that they may be intercepted by the enemy, messages - especially important ones - are usually encrypted.
- b. Encrypted messages consist of groups of digits (number messages) or letters (phonetic messages). Occasionally a message may contain both number groups and phonetic groups. Encrypted messages are more cumbersome and more difficult to work with, but do provide a higher degree of security of information.

Preparing to Transmit and Receive Messages Once contact has been established, one station may ask the other if he has any messages to pass. Or a station may simply state that he has a message. When a message is to be passed, the station which is going to send the message will usually ask the receiving station if he is ready to receive it. The receiving station will either answer in the affirmative or ask the transmitting station to wait a bit. If the sending station should happen to be not quite ready to transmit, he may ask the receiving station to stand by (следить or быть на приеме).

3. Date/Time Group Each message to be transmitted is dated and timed by the transmitting station according to when the message was given to it for purposes of transmission. The date and time are referred to as the date/time group. When given in full, the date/time group will consist of the day, month, year, and time of day. Numbers rather than words are used for the months; the year is usually designated by the last two digits only; the time

The following exchange might typically precede the transmission of a message:

TO	FM	TEXT
328	111	Приём.
(111)	328	Да, да. Что имее́те для меня́? Приём.
328	111	Имею ра́дио. Вы гото́вы к приёму?
111	328	Да, к приёму гото́в. Дава́й!
328	111	Переда́м че́рез 5 мину́т. Бۇдьте на приёме!
		Как вы меня́ по́няли? Приём.
(111)	(328)	По́нял вас, по́нял. Слежу́.

COPYING MESSAGES

Messages drafted prior to transmittal follow a certain format in order to facilitate handling. This is especially true of encrypted (digital/phonetic) messages. The two main parts of a message are the message heading (or preamble) and the message text. In addition, the message format may include a signature (or postamble) after the text.

Message Heading A message heading - in Russian заголовок - may consist of any or all of the following elements. Those elements which are included and those which are omitted are determined by the operating procedures of the transmitting station. It is even possible - but highly unusual - that the heading may be omitted from a message entirely.

1. Message Number Each station maintains a record of outgoing messages, assigning successive numbers (from 1 up) to each new message. A new number series (beginning from 1) is initiated on a daily, weekly, monthly, or yearly basis, depending on volume. The message number provides for easy reference to a specific message. The message number is usually the first item in the heading, and is often preceded by the word номер . Example:
"Номер 121."
2. Group Count The group count tells the recipient of a message exactly how many groups of digits or letters there are supposed to be in the text of that message. By checking the actual number of groups received against the group count, the recipient can immediately detect mistakes involving missing or extra groups. The group count of a message may often be identified by the word групп (genitive plural of группа), which will precede or follow the group count number. Example:
"групп 278."
3. Date/Time Group Each message to be transmitted is dated and timed by the transmitting station according to when the message was given to it for purposes of transmission. The date and time are referred to as the date/time group. When given in full, the date/time group will consist of the day, month, year, and time of day. Numbers rather than words are used for the months; the year is usually designated by the last two digits only; the time

is always a four-digit number based on the 24-hour system. As an example, the 13th of October 1975 at 2:37 P.M. would appear as " 13-ого 10-ого 75-ого 1437 ." (Remember that Russian uses genitive case with dates).

A full date/time group is probably the exception rather than the rule. Quite often the year is omitted, frequently the month as well, and sometimes only the time remains - and even it can be omitted at times.

The word *время* is sometimes inserted into the heading as a "tag" (an identifying word like *номер* and *групп* above) in order to identify the following number as the time. Example: "Время 0928."

4. Precedence Obviously, some messages will contain more important information than others. Therefore, all messages are assigned a precedence, or order of priority. This means that messages of greater importance are given priority in transmission. Sometimes, low precedence messages are even interrupted during transmission in order to pass a high precedence message.

In Soviet communications messages are assigned one of five precedence. In order from lowest to highest they are *обыкновенная* (routine), *срочная* (abbreviated *СР*), *внеочередная* (abbreviated *ВН*), *самолёт* (abbreviated *СМЛ*), and *воздух* (abbreviated *ВЗД*). Note that the adjectival

precedences (*обыкновенная*, *срочная*, *внеочередная*), besides being found in feminine modifying *радиограмма*, can also be found with neuter endings modifying the word *радио*, which is a shortened form of *радиограмма*.

The precedence may be given by simply stating the category title (*самолёт*, *внеочередная* etc.) or by stating the abbreviation (*СР*, *ВН* etc.). If the abbreviation is used, it will usually be passed using phonetics. In other words, *СР* would be passed as "Семён Роман", *ВН* as "Владимир Никола́й", etc.

The tag word *сéria* (precedence) is sometimes used in the heading. Example: "Сéria срочная." The precedence may often be omitted from the heading.

5. Addressee Each message will be intended for a specific station(s), office(s), or person(s). In order to ensure that the message reaches the right place or person, an addressee designation is often inserted in the message preamble. This designation may take various forms. Sometimes the addressee is given in plain language, sometimes callsigns are used, and sometimes numbers are used to represent the job (i.e., commander, chief cook, mechanic, etc.) for whom the message is intended.

Since the message is going 'to' someone, the addressee is usually given in the dative case.

Examples: командиру роты (plain language),
официанту (callsign), 008-ому (number).

As with other parts of the preamble, the addressee is often omitted.

6. Other Items The various parts of the preamble, are often separated by the word раздел, which is represented in English by a slash mark (/). The phrase большой раздел, which is represented by a double slash mark (//), may also be encountered; if used, it serves to separate major parts of the message, as for example the preamble from the text.

It cannot be stressed strongly enough that the above explanation is only a guide. Any of the items mentioned may be deleted, according to either the particular operating procedures of a specific net or the mood of the individual radio operator. Indeed, items other than those mentioned above may be added to the preamble.

It should also be stressed that you should not rely too much on tags (the words номер, групп, etc.) to identify the various parts of the preamble for you. These words can be and often are omitted, leaving then simply a series of numbers, which must be figured out by other means than tag words.

Message Text Encrypted messages consist of either letter or number groups, or a combination of both. In numerical messages the groups may be of varying length. In phonetic (letter) messages the groups are usually of uniform length, usually five letters per group.

In phonetic messages, groups are easily differentiated. But number messages can sometimes be confusing, due to the fact that groups longer than 3 digits are broken down into dinomes and/or trinomes by the operator when he is transmitting the message. For example, the only sure way to tell if the numbers "шестьсот тринадцать двести двадцать один" should be written as one group (613221) or two groups (613 221) is by the length of the pause between the two trinomes. This may seem difficult to you at first, but with experience it will become easier. Generally, a safe rule to follow when unsure is to write it as one group, because pauses between message groups are usually quite distinct.

In radio communications, specific length groups are normally passed in a standard format. For two and three digit groups, the speaker simply reads the group as one number:

21 - Два́дцать о́дин
55 - Пя́тьдесят пять

132 - Сто́ три́дцать два
231 - Две́сти три́дцать о́дин

However, groups longer than three digits are passed as combinations of dinomes (two digit numbers) and trinomes (three digit numbers) as follows:

Four digit numbers are passed as two dinomes with little or no pause between the dinomes:

4135 - Со́рок о́дин три́дцать пять

If this were two separate two digit groups there would be a distinct pause between the dinomes.

Five digit numbers are passed as a dinome and a trinome with little or no pause between the dinome and trinome:

51244 - Пя́тьдесят о́дин две́сти со́рок че́тыре

A two digit group followed by a three digit group would be separated by a distinct pause. (NOTE: a five digit group is almost never passed as a trinome followed by a dinome.)

Six digit numbers are passed as two trinomes with little or no pause between the trinomes:

619427 - Ше́стьсо́т де́вятна́дцать че́тыреста́ два́дцать се́мь

If this were two separate three digit groups there would be a distinct pause between the trinomes. (NOTE: six digit groups, although rarely, may be encountered being passed as three dinomes. Again there is little or no pause between the dinomes.)

Radio operators are well-known for using shortcuts whenever possible, and messages present no exception. When presented with a group in which two or more letters or numbers are the same, the operator's natural tendency is to pronounce them using as few syllables as possible. For example, the group "ББББН" will often be pronounced as "три Борис два Николай", the group "ССССС" as "пять Семён", the group "МТУХХ" as "Михаил Татьяна Ульяна два Харитон", and so on. Note that in the case of phonetics, there is normally no declension. For example, you would probably hear the group "ААААА" pronounced as "пять Анна" rather than the grammatically correct form "пять Анн".

Number groups are treated in a similar manner. Numerical nouns are usually used in this case. For example, the group "66666" might be pronounced as "пять шестёрки", the group "5555" as "четыре пятёрки", and so on. If the message consists of groups of uniform length, you might also hear something like "группа единиц" (literally, "a group of ones"). This means that in a message consisting entirely of, let's say, five-digit groups, this particular group would be "11111"; if the message consists of six-digit groups, it would look like "111111", and so on.

When confronted with such shortcuts as noted above, remember to write them down on your transcript as groups of letters or numbers. There is normally no need to write out the words. For example, if you hear "пять Роман" write it down as the phonetic group "PPPPP" rather than writing out the words "пять Роман" or writing down the form "5P" similarly, if you hear the phrase "четыре нуля" transcribe it as the number group "0000" rather than writing out the words.

Radio operators frequently make mistakes when reading off messages. If the operator catches his mistake at the moment he makes it, he will make an on-the-spot correction. Such corrections will normally be prefaced by the word "отставить" (meaning "hold it", "stop", "wait"). Then the letter, number, or group in question will be repeated in its correct form.

Message Signature A message may or may not be signed by the originator. If a message does contain a signature, it will be along the same lines as the addressee; that is, it may be given in plain language, by means of covernames or callsigns, or by means of numbers representing a job title. Although the signature usually follows the message text, it is possible that it may be included in the preamble. Examples: "Подписал начальник связи," "От моего 75-ого."

MESSAGE RECEIPTING

After a message has been transmitted and copied, it must be receipted for. A receipt guarantees the transmitting station that his message has been copied without error. Therefore, before the receiving station can give a receipt, he must be absolutely certain that his copy is 100% in agreement with the original message. To ensure accuracy, the copy is usually either proofread or spot-checked.

Proofreading Right after a message has been transmitted, the sending station may ask the recipient to "proofread". In radio communications this means to read back the entire message aloud, so that the sender can check it against the original for accuracy. This type of check is normally only used with very short messages or perhaps with very important messages.

Repeats If the recipient is not certain that he has copied every group accurately, he will spot-check those groups he is unsure of by asking the sender to repeat the groups in question. Groups are usually identified by their numerical order in the message. For example, if the receiver said "Повтори мне 31-ую, 32-ую, и 46-ую," he would be asking that the 31st, 32nd, and 46th groups be repeated. (Remember that the Russian word for group is группа.) If the recipient happened to miss a whole series of groups for some reason, he will ask the sender to repeat the whole series. For example, he may say, "Повтори с 48-ой до 65-ой" (Repeat from the 48th up to the 65th group).

Normally, the sending station will transmit the entire message and then ask the receiving station(s) if any groups need to be repeated. Often, however, especially in the case of long messages, the sending operator will break up the message after every so many groups (say, 20 or 40) with a check of readability. The receiving station(s) may then ask for group repeats at that time. This type of check reduces the possibility of long segments of the message being missed.

Receipting Once the recipient is sure his copy is complete and accurate, he gives a verbal receipt. This usually consists of a simple statement such as "Даю квитанцию" (I give a receipt) or "Подтверждаю" (I acknowledge). Every designated recipient of a message must receipt for that message.

MESSAGE ROUTING

Multiple Addressee A message may be intended for only one station. However, if it is intended for more than one station, the sending station must establish contact with all of them. The transmitting station may call each station by name (that is, by callsign), but if a message is addressed to all the stations of a net, the sending station may say "Радио для всех" (The message is for everyone) or "Радио касается всех" (The message concerns everyone). If the message is intended for all stations except one or two, the sender may mention them by name, as for example "Радио касается всех с исключением 536-ого и 708-ого" (The message concerns everyone with the exception of (stations) 536 and 708).

Relaying Messages Sometimes a message may be intended for a station with whom the originating station does not have direct contact. In this case, the originating station may ask an intermediary station - one which has contact with both the stations in question - to relay the message to its intended recipient. The relaying station will then copy down the message - if he has not done so already - and retransmit it to the intended addressee.

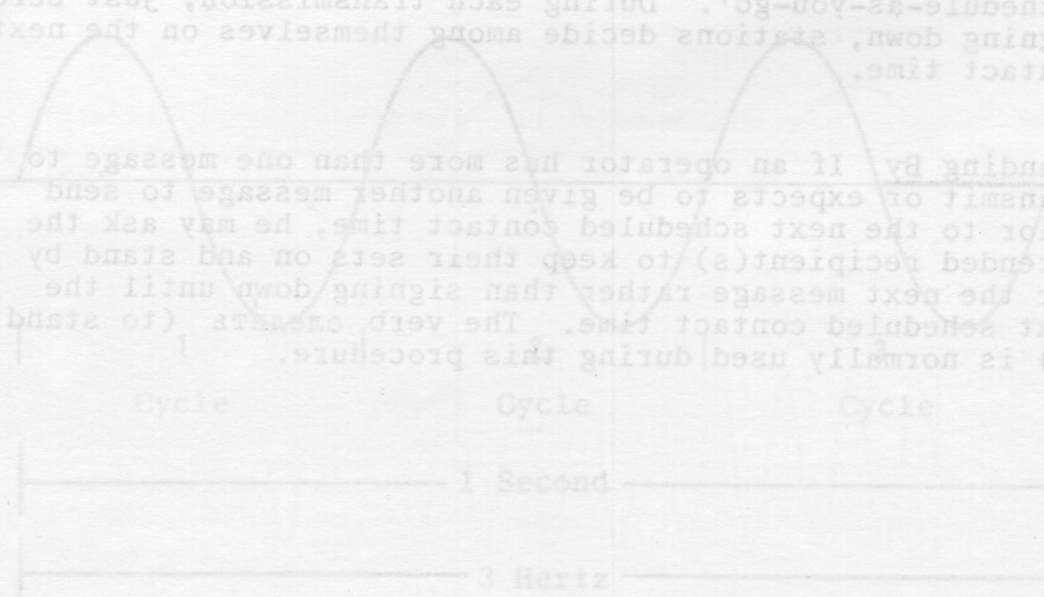


Figure 15

SIGN DOWN

Once all messages have been passed, stations normally sign down and turn off their radio sets until their next scheduled contact time. Schedules determine what time radio stations are to switch on for contact.

Hour and Half-hour Schedules Depending on the volume and frequency of messages to be transmitted, stations may decide to contact each other every hour or every half-hour. If there happen to be no messages to transmit at that time, then the contact serves as simply a communications check (проверка связи). If hourly or half-hourly contacts prove to be too frequent for the volume of traffic, stations may use fixed schedules.

Fixed Schedules These schedules are set up in advance on a daily, weekly, monthly or yearly basis, and specify the exact times during each day when stations are to make contact. Fixed schedules can be altered to a certain degree, according to the needs of individual stations or nets.

Flexible Scheduling This type of scheduling could be called 'schedule-as-you-go'. During each transmission, just before signing down, stations decide among themselves on the next contact time.

Standing By If an operator has more than one message to transmit or expects to be given another message to send prior to the next scheduled contact time, he may ask the intended recipient(s) to keep their sets on and stand by for the next message rather than signing down until the next scheduled contact time. The verb следить (to stand by) is normally used during this procedure.

CHANGING FREQUENCY

Radio stations are assigned an operating frequency (рабочая частота) and one or more alternate frequencies (запасная частота). If communications are poor on the operating frequency and tuning does not help, stations will by mutual agreement and with the permission of the control station change to the alternate frequency.

Radio waves are measured in two ways. When expressed as a frequency, radio waves are measured in "hertz". When expressed as a wavelength, radio waves are measured in "meters".

Radio Frequency (радиочастота). The frequency of a radio wave is the number of complete oscillations (cycles) that occur in one second. Frequencies are expressed in "hertz" (герц), in honor of Heinrich Hertz the German physicist. One hertz is equal to one complete oscillation (cycle) per second. (See Figure 15) Since radio frequencies are quite high the terms kilohertz (килогерц) (1000 hertz), megahertz (мегагерц) (1,000,000 hertz), and gigahertz (гигагерц) (1,000,000,000 hertz) are commonly used.

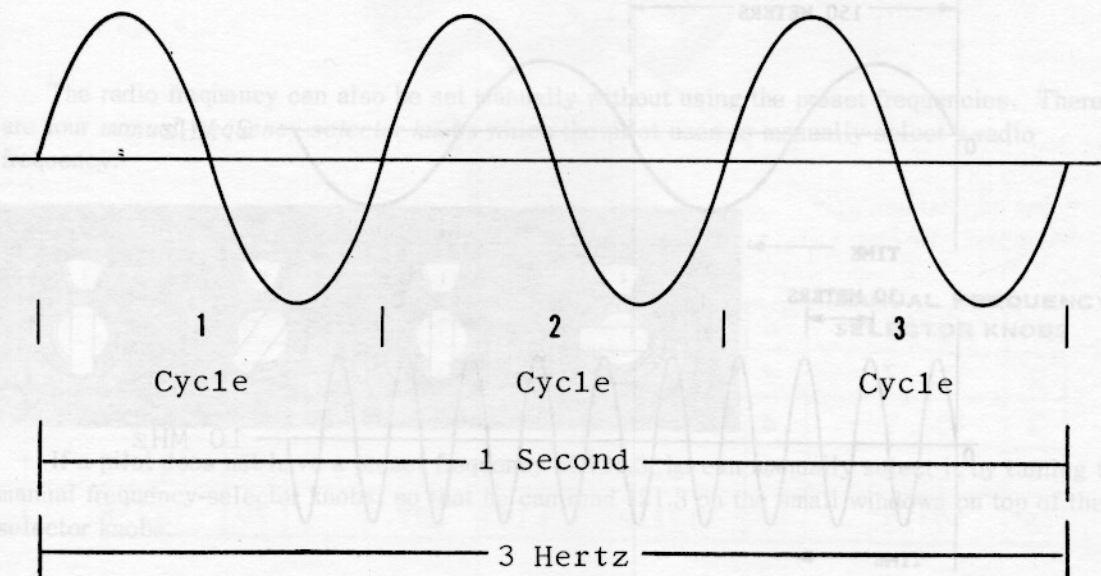
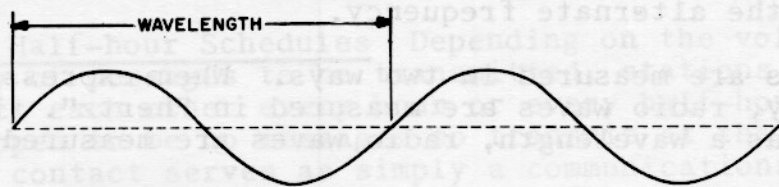


Figure 15

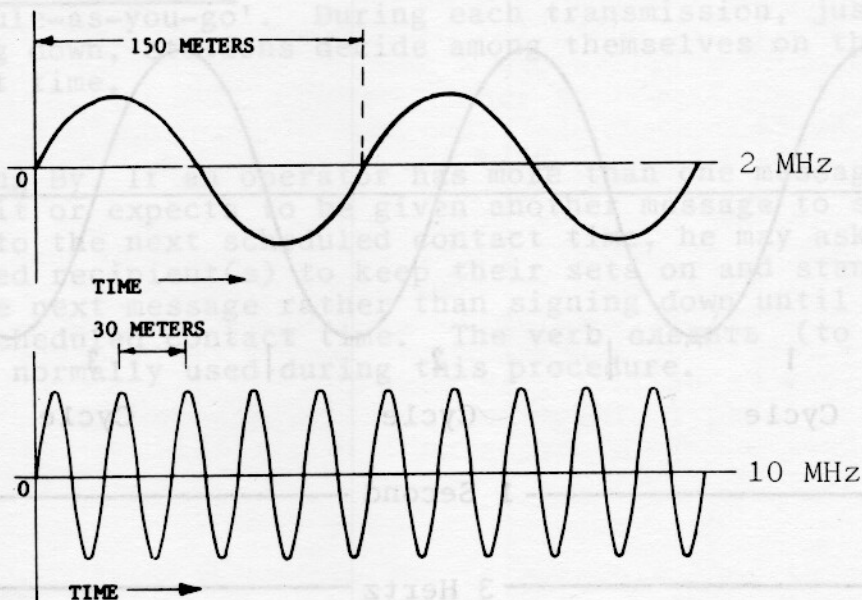
Wave Length (длина волны) The length of a radio wave is the distance traveled by the wave in the period of time required to complete one oscillation (cycle). Each complete cycle of the wave is one wavelength and is expressed in meters. This wave length may be measured from the start of one wave to the start of the next wave, or from the crest of one wave to the crest of the next wave. In either case the distance is the same. (See Figure 16)



WAVELENGTH OF A RADIO WAVE

Figure 16

The following relationship exists between frequency and wave length. The longer the time of one cycle the longer the wave length and the lower the frequency. The shorter the time of one cycle, the shorter the wavelength and the higher the frequency. Figure 17 compares the wavelength of a 2 MHz wave with that of a 10 MHz wave.



COMPARISON OF TWO WAVES OF DIFFERENT FREQUENCY

Figure 17

CHANGING FREQUENCY

Radio stations are assigned an operating frequency (рабочая частота) and one or more alternate frequencies (запасная частота). If communications are poor on the operating frequency and tuning does not help, stations will by mutual agreement and with the permission of the control station change to the alternate frequency.

Radio waves are measured in two ways. When expressed as a frequency, radio waves are measured in "hertz". When expressed as a wavelength, radio waves are measured in "meters".

Radio Frequency (радиочастота). The frequency of a radio wave is the number of complete oscillations (cycles) that occur in one second. Frequencies are expressed in "hertz" (герц), in honor of Heinrich Hertz the German physicist. One hertz is equal to one complete oscillation (cycle) per second. (See Figure 15) Since radio frequencies are quite high the terms kilohertz (килогерц) (1000 hertz), megahertz (мегагерц) (1,000,000 hertz), and gigahertz (гигагерц) (1,000,000,000 hertz) are commonly used.

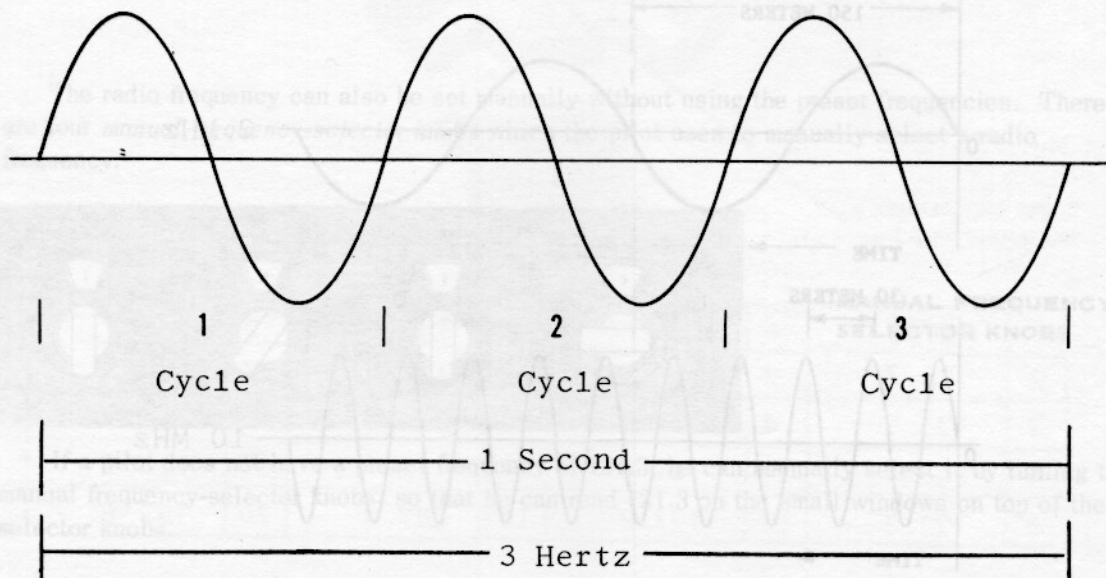
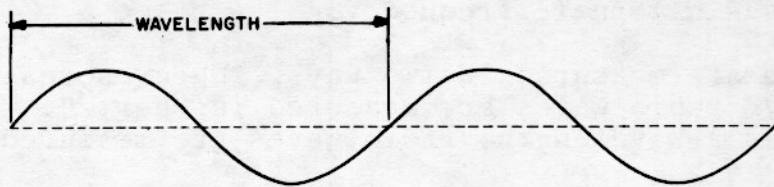


Figure 15

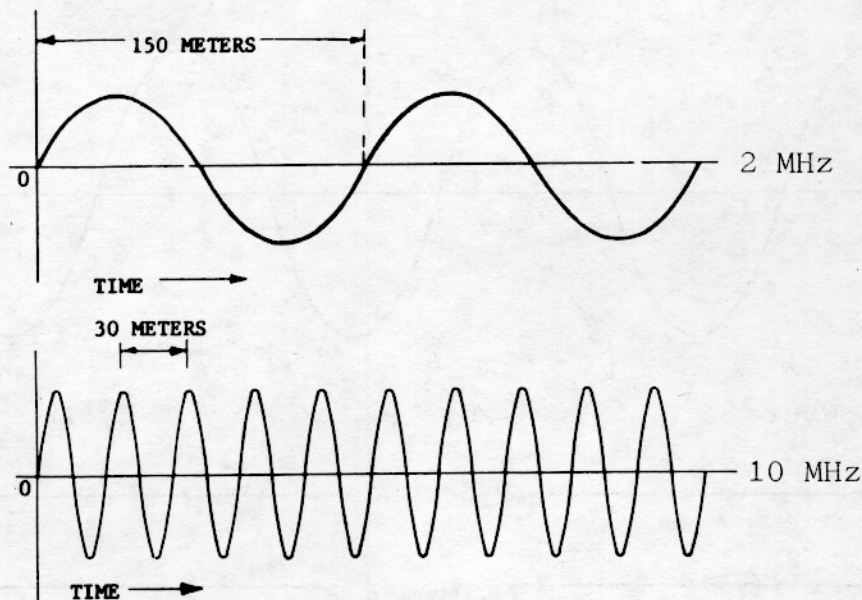
Wave Length (длина волны) The length of a radio wave is the distance traveled by the wave in the period of time required to complete one oscillation (cycle). Each complete cycle of the wave is one wavelength and is expressed in meters. This wave length may be measured from the start of one wave to the start of the next wave, or from the crest of one wave to the crest of the next wave. In either case the distance is the same. (See Figure 16)



WAVELENGTH OF A RADIO WAVE

Figure 16

The following relationship exists between frequency and wave length. The longer the time of one cycle the longer the wave length and the lower the frequency. The shorter the time of one cycle, the shorter the wavelength and the higher the frequency. Figure 17 compares the wavelength of a 2 MHz wave with that of a 10 MHz wave.



COMPARISON OF TWO WAVES OF DIFFERENT FREQUENCY

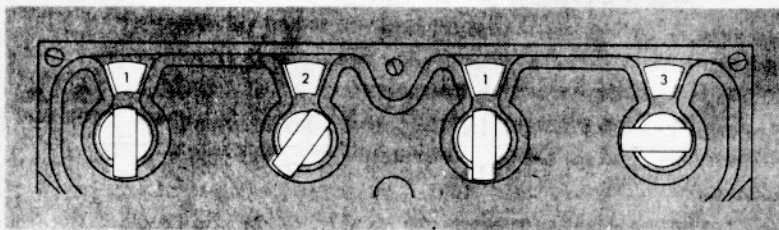
Figure 17

Radio Frequency Spectrum. Radio equipment is designed to operate in different parts of the radio frequency spectrum. Most tactical radio sets operate within the 1.5 MHz to 400 MHz portion of the frequency spectrum. Radio frequencies are divided into groups or bands of frequencies for convenience of study and reference. Appendix A shows the entire frequency spectrum in both Russian and English.

Frequency Bands (диапазон радиочастот) The radio frequency spectrum is divided into a number of segments called frequency bands. Each band is reserved for a specific use or uses. For example, in the U.S. the band of frequencies from 535 kHz through 1605 kHz is known as the standard AM broadcast band and the band 88-108 MHz is known as the FM broadcast band.

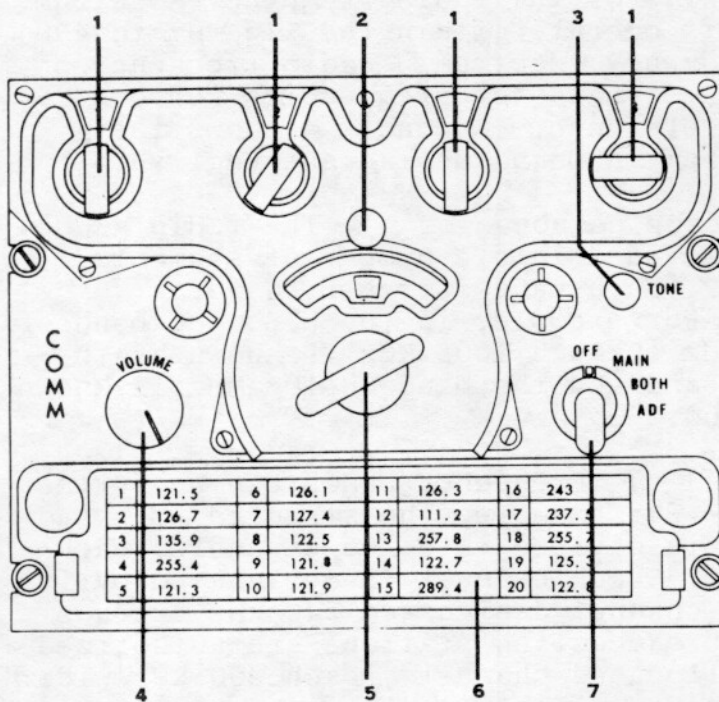
Channels ((радио) канал) Frequency bands can be further divided into channels. For example, the standard AM broadcast band 535-1650 kHz is divided into 106 channels, each of which is 10 kHz wide. Each channel is designated by its center frequency. The channel designated 540 kHz extends from 535-545 kHz. FM broadcasting stations are authorized for operation on 100 allocated channels, each 200 kHz wide. These channels are numbered consecutively from channel No. 201 on 88.1 MHz to No. 300 on 107.9 MHz. On some radio equipment, the channels are preset to designated frequencies (as on a TV set), and are referred to by number, e.g. Channel 1, Channel 2, Channel 3, etc. Figure 18 shows the channels assigned to an Air Force radio set and their numbering.

The radio frequency can also be set manually without using the preset frequencies. There are four *manual frequency-selector knobs* which the pilot uses to manually select a radio frequency.



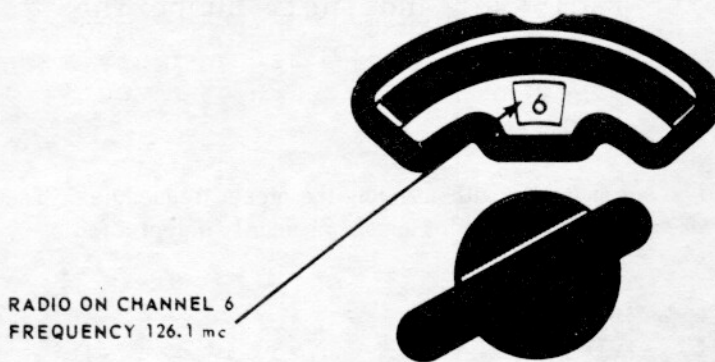
**MANUAL FREQUENCY-
SELECTOR KNOBS**

If a pilot does not have a preset frequency of 121.3, he can manually select it by turning the manual frequency-selector knobs, so that he can read 121.3 on the small windows on top of the selector knobs.



**COMMAND RADIO
CONTROL PANEL
OF T-38**

1. MANUAL FREQUENCY-SELECTOR
BUTTONS
2. MODE SWITCH
3. TONE BUTTON
4. VOLUME CONTROL
5. CHANNEL SELECTOR
6. CHANNEL FREQUENCY CARD
7. FUNCTION SWITCH



1	121.5	6	126.1	11	126.3	16	243
2	126.7	7	127.4	12	111.2	17	237.5
3	135.9	8	122.5	13	257.8	18	255.7
4	255.4	9	121.8	14	122.7	19	125.3
5	121.3	10	121.9	15	289.4	20	122.8

Figure 18

Wave Bands (диапазо́н радиово́лн) Frequency bands may also be referred to by wavelength. This is especially common in the Amateur Radio Bands and the International Broadcasting Bands. The following chart shows how these bands are allocated for international broadcasting.

WAVELENGTH Meter Band	FREQUENCY	
	MHz Band	kHz Band
49	6	5950 - 6200
41	7	7100 - 7300
31	9	9500 - 9775
25	11	11700 - 11975
19	15	15100 - 15450
16	17	17700 - 17900
13	21	21450 - 21750

Shortwave Radio (коротковолно́вая радиосвя́зь) In the early days of radio, the radio frequency spectrum was simply divided into four categories: Long Wave, Medium Wave, Short Wave, and Ultrashort Wave. With increased crowding of the airwaves and newer, more sophisticated equipment, it became necessary and possible to use frequencies below Long Wave and above Ultrashort Wave. The original four categories were replaced by a more scientific system which is shown in Appendix A. The original four categories are roughly comparable to four of the new categories, but are not directly interchangeable.

Long Waves (дли́нные во́лны) - Low Frequency (LF)

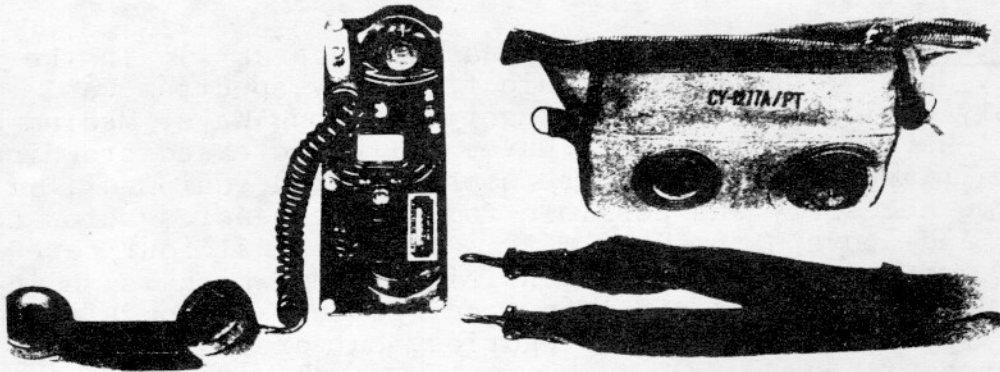
Medium Waves (сре́дние во́лны) - Medium Frequency (MF)

Short Waves (коро́ткие во́лны - КВ) - High Frequency (HF)

Ultrashort Waves (ультракоро́ткие во́лны - УКВ) - Very High
Frequency (VHF)

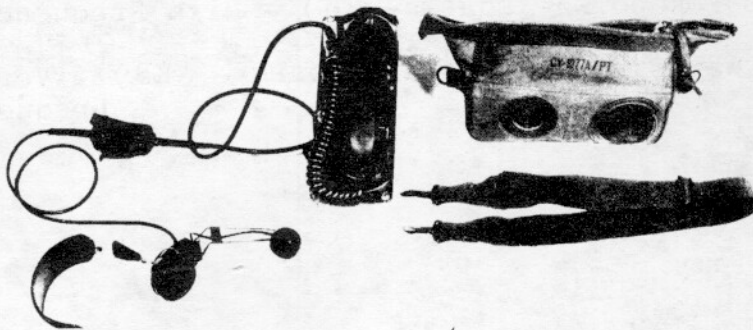
WIRE COMMUNICATIONS

Wire Communications (ПРОВОДНАЯ СВЯЗЬ) Most radio stations use a field telephone system to supplement or back up radio communications. The simplest such system would consist of two field telephones connected by temporary telephone lines. These lines may be suspended from supports, buried, or laid on the surface of the ground. Wire communications are commonly referred to as "landline" (ПРОВОД). These landline circuits provide a separate mode of communications when radio equipment is tied up, malfunctioning or undergoing repairs. The usual range of a field phone without any amplifier is 2 - 20 miles. Although communications deteriorate after about 5 miles (see Figures 19 & 20).



ТЕЛЕФОННЫЙ АППАРАТ
TELEPHONE SET

Figure 19

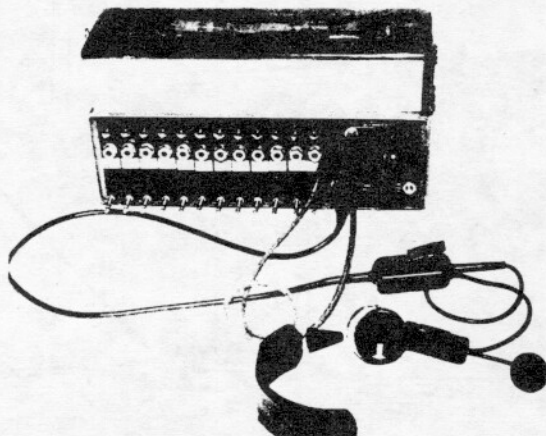


ГАРНИТУРА
TELEPHONE SET (HANDSET-HEADSET)

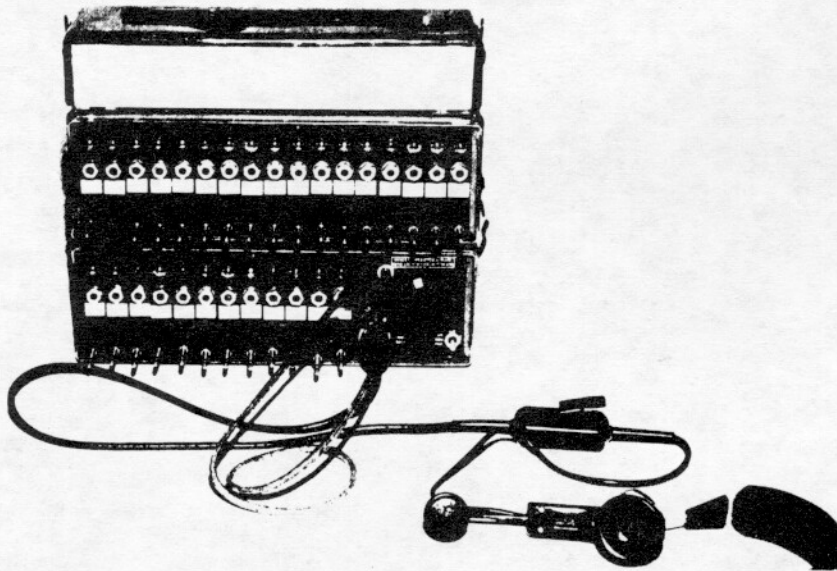
Figure 20

Subscriber (а́боне́нт) Anyone having telephone equipment installed at his location is referred to as a subscriber. In general, anyone who subscribes to (is a user of) a communications system is called a subscriber.

Switchboard (ко́ммута́тор) When it is necessary for a station to maintain field telephone contact with more than one subscriber, a switchboard is installed at a convenient central location to handle the additional circuits required for each separate subscriber. (See Figures 21 - 25).

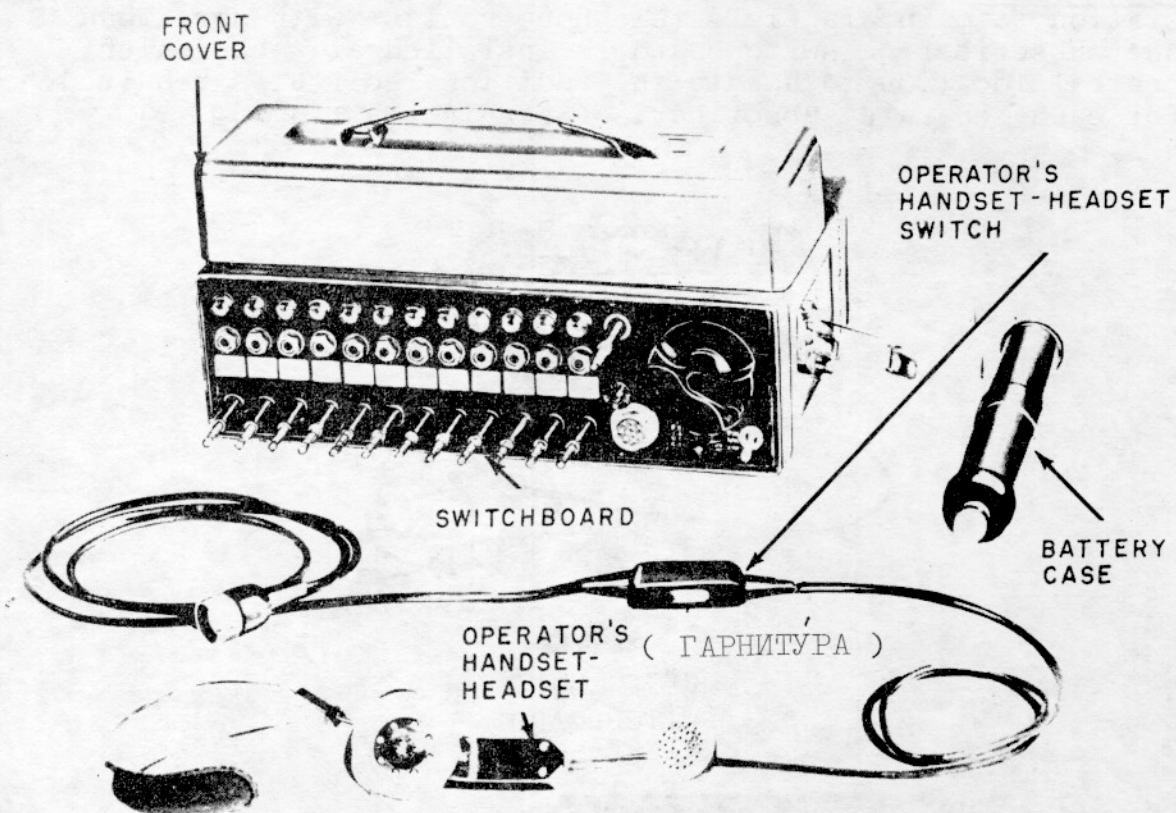


КОММУТАТОР
SWITCHBOARD
Figure 21



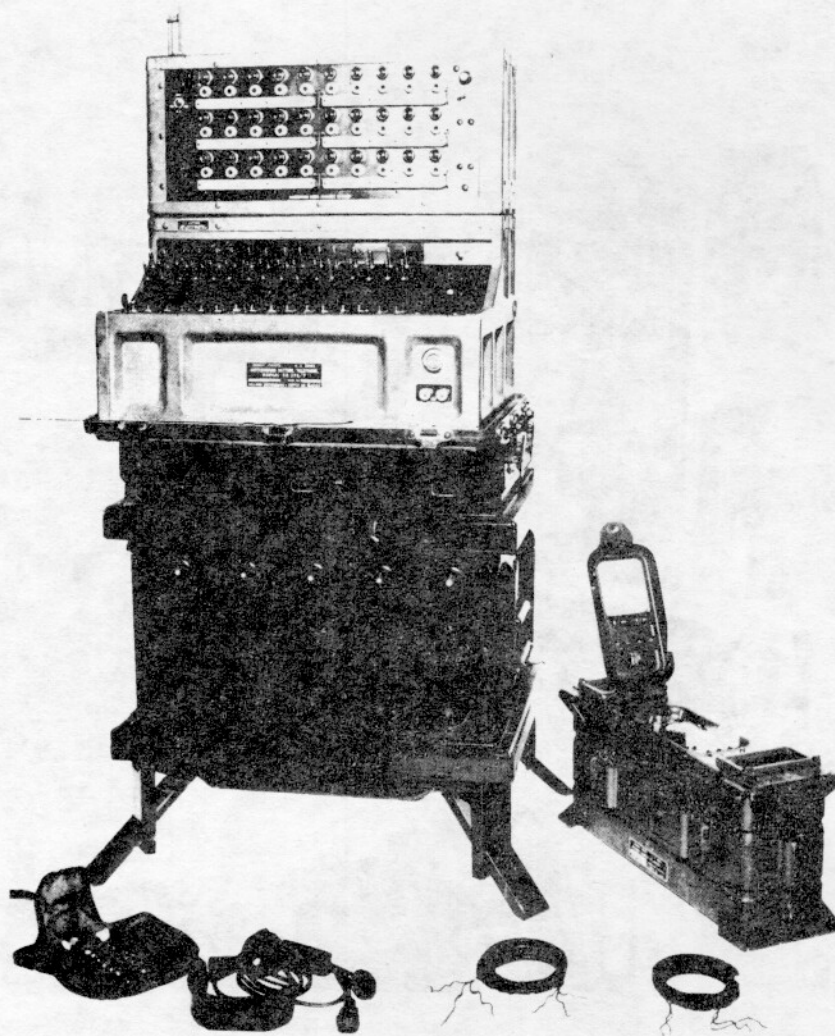
2 SWITCHBOARDS STACKED

Figure 22



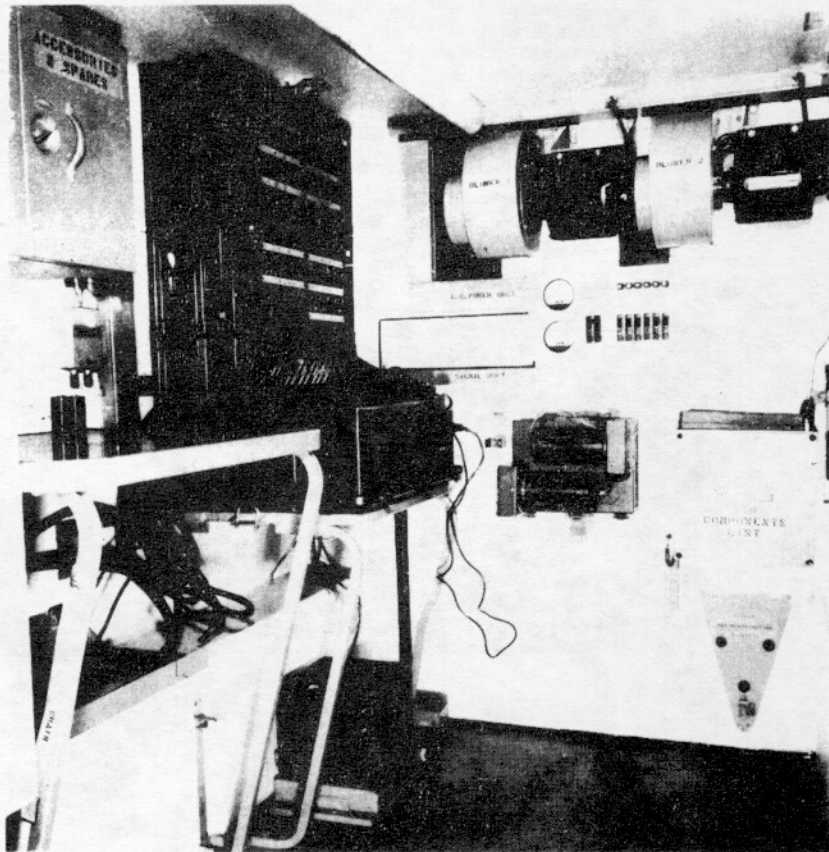
MANUAL TELEPHONE SWITCHBOARD

Figure 23



KOMMYTATOP
SWITCHBOARD

Figure 24



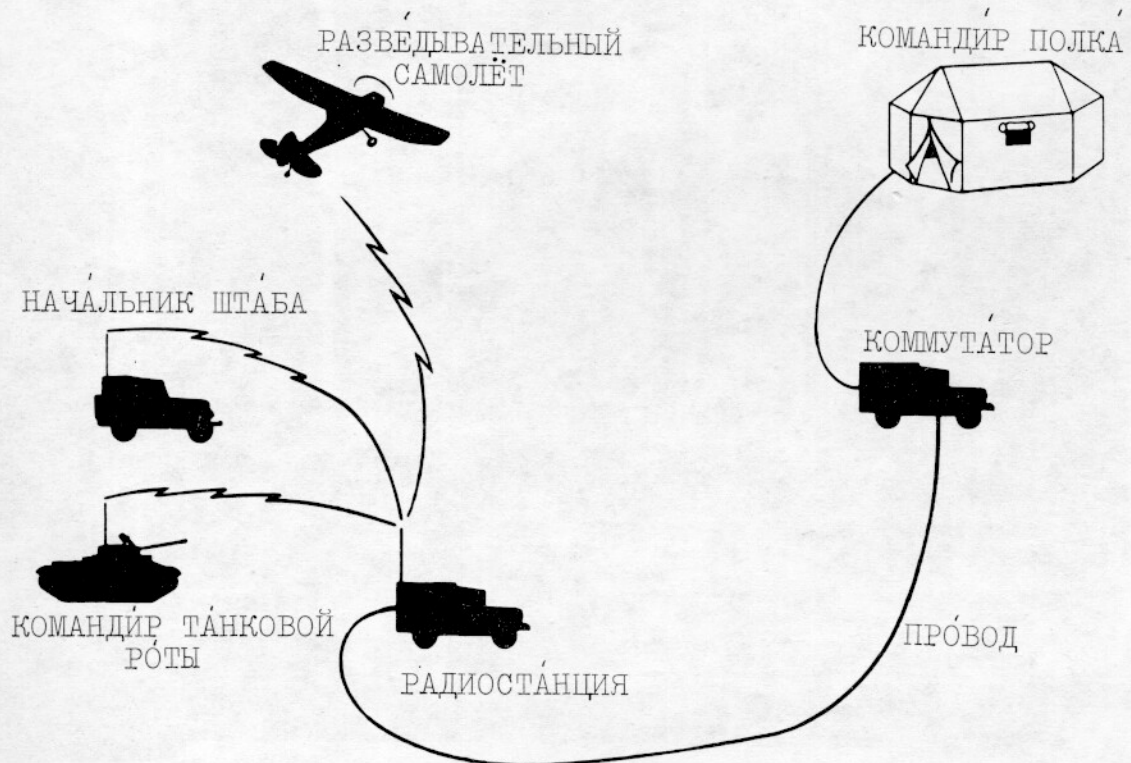
MANUAL TELEPHONE CENTRAL OFFICE

Figure 25

STATION OPERATION

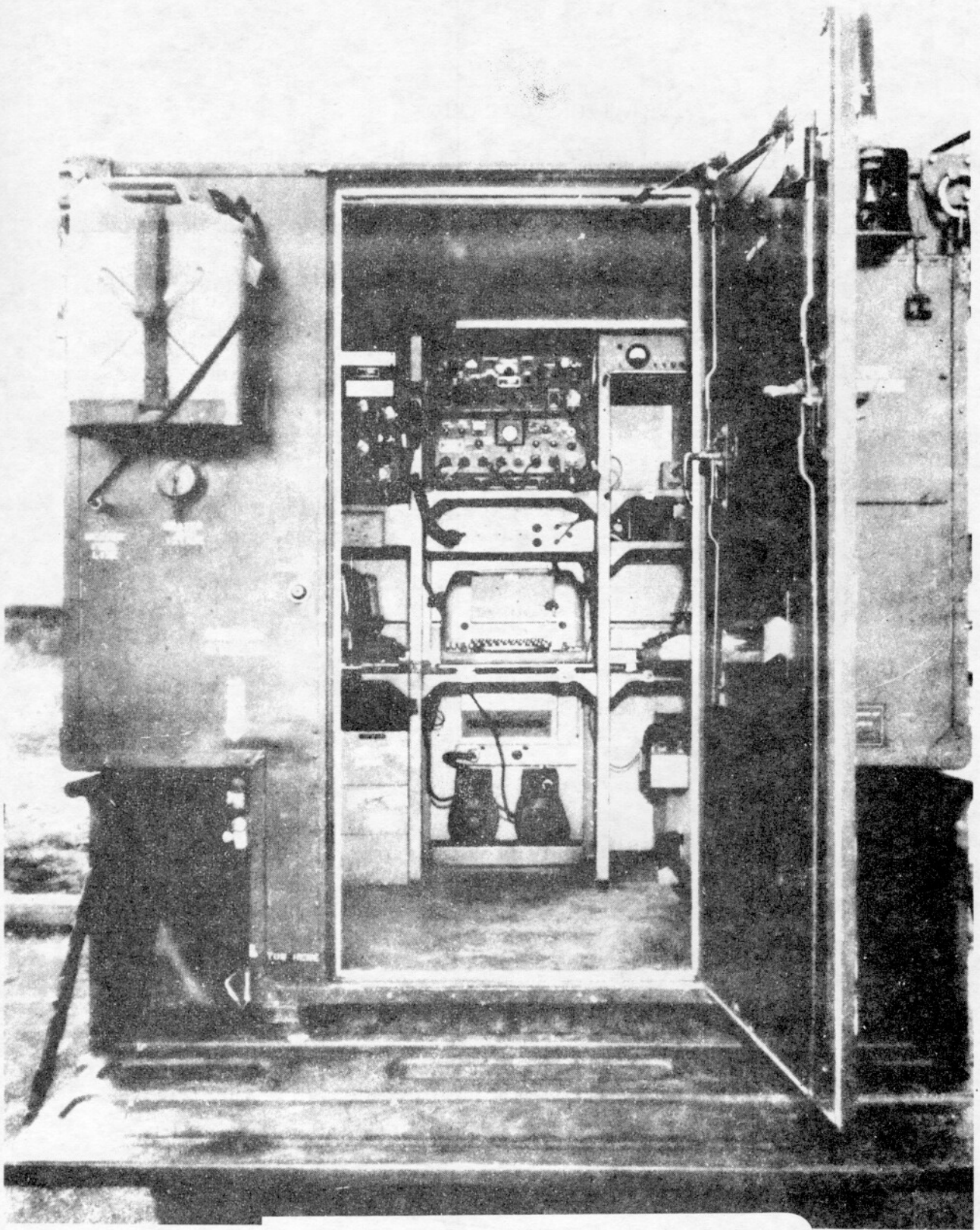
Station Personnel Larger radio stations are manned by stations crews (экипаж радиостанции) and managed by a station chief (начальник радиостанции) or crew chief (начальник экипажа). The next ranking person at the station is the senior radiotelephone operator (старший радиотелефонист). When a radio station operates long hours or around the clock, station personnel are usually divided into shifts or tricks (смена). For example, a 24-hour operation might be split into three 8-hour shifts. Each shift is run by a shift chief (начальник смены).

Communication Centers (узел связи) A communication center is a facility responsible for the reception, transmission and delivery of messages. It may include radio stations, radio relay stations, telegraph stations, telephone stations, switchboards and other communications facilities. Communications centers may be fixed (стационарный узел связи) or mobile (подвижной узел связи). (See Figure 26 - 31).



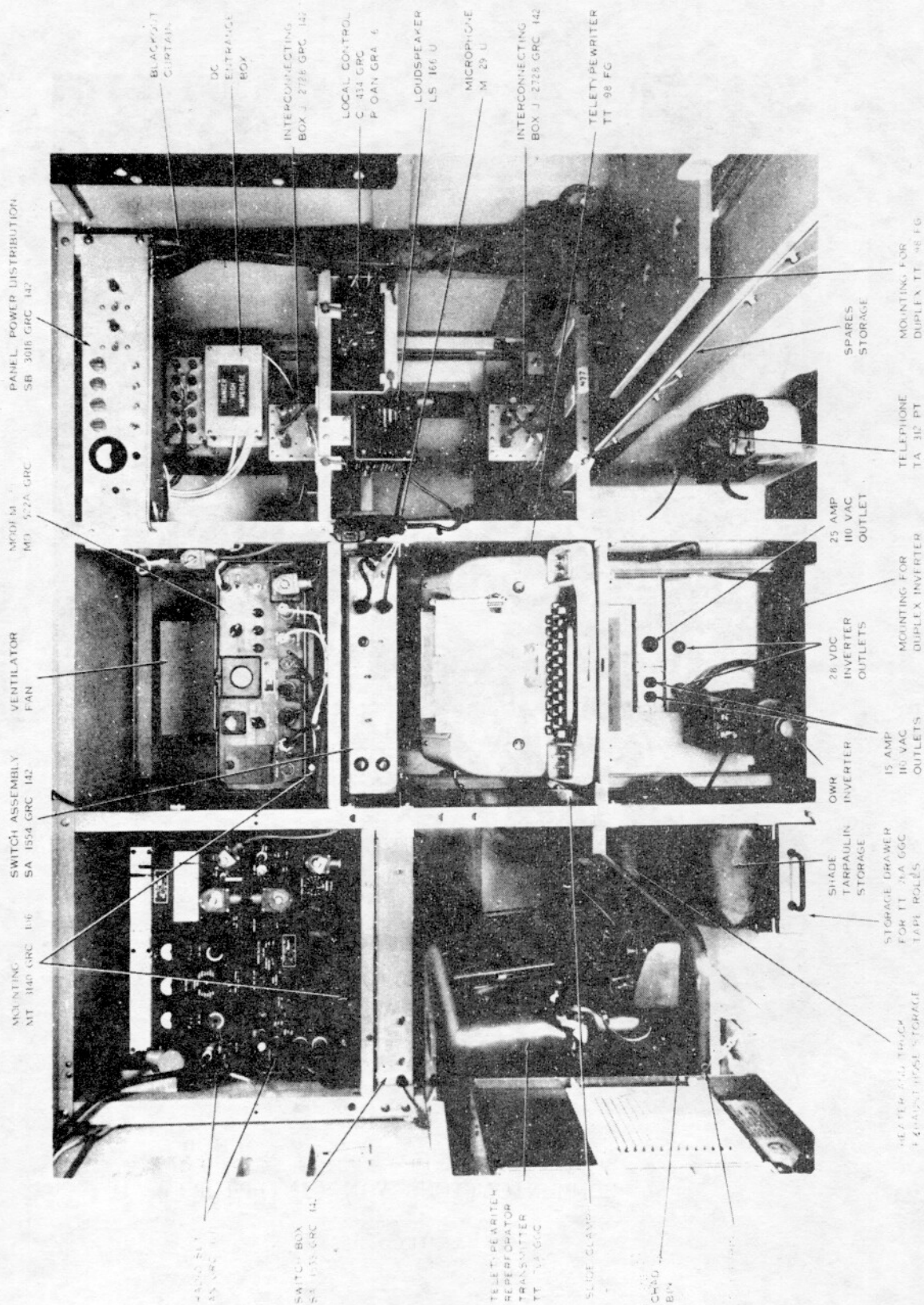
TYPE EMPLOYMENT OF RADIO-WIRE INTEGRATION SYSTEM

Figure 26

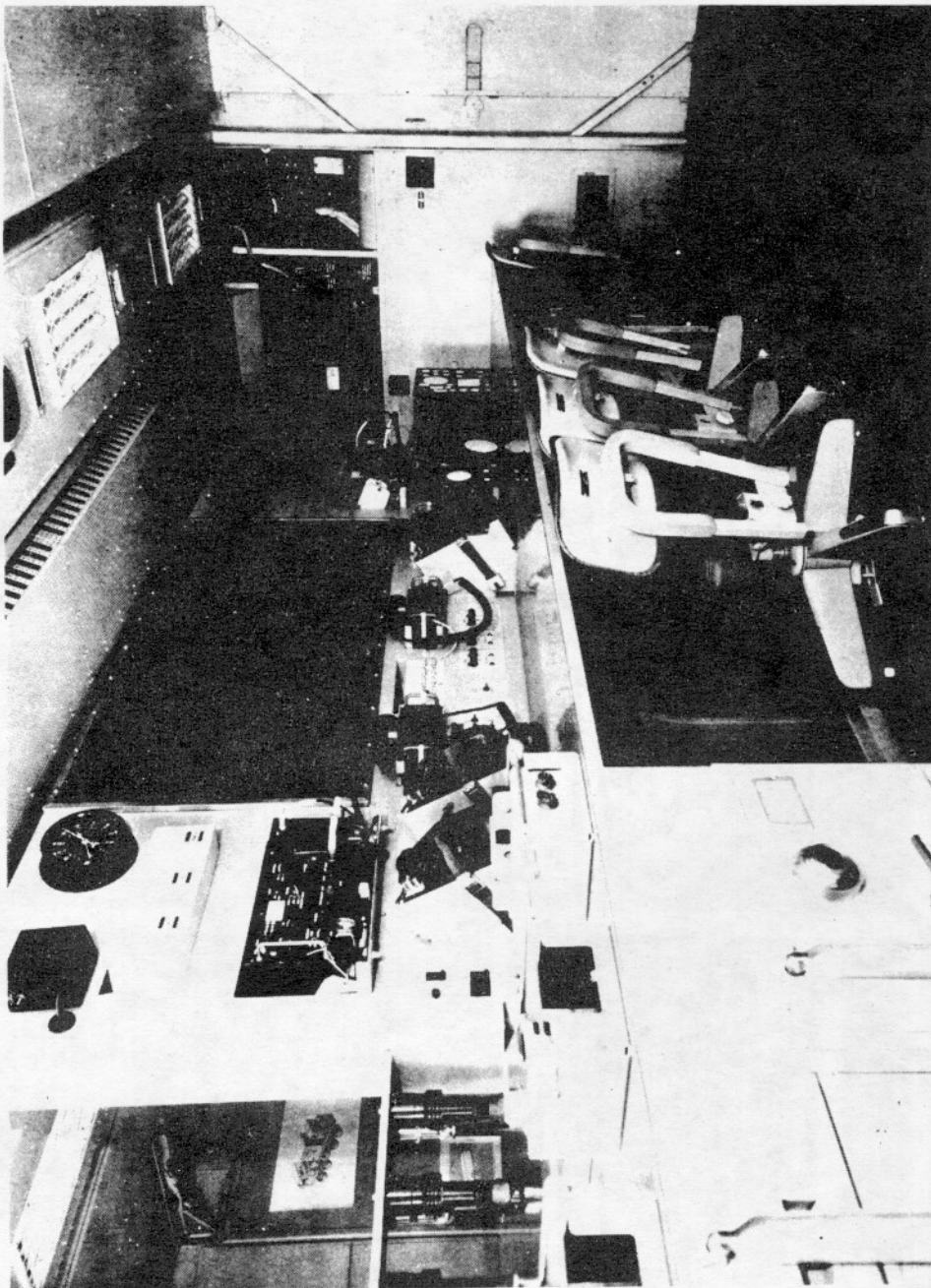


COMMUNICATIONS VAN (INTERIOR)

Figure 27

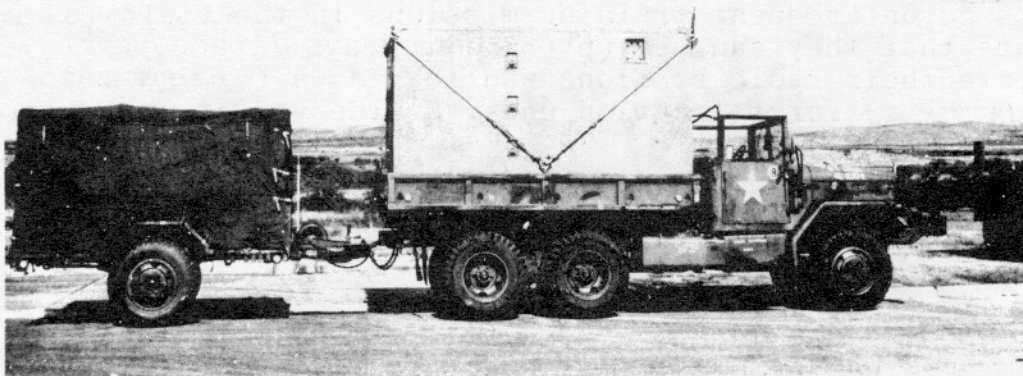


COMMUNICATIONS VAN (INTERIOR)
Figure 28



COMMUNICATIONS VAN (INTERIOR)

Figure 29



АППАРАТНАЯ МАШИНА СВЯЗИ
COMMUNICATIONS VAN

Figure 30



АППАРАТНАЯ МАШИНА СВЯЗИ
COMMUNICATIONS VAN

Figure 31

Training (обучение) Military communications
units go on frequent training missions in the field to
ensure that they can set up (развёртывать / развернуть)
operate their radio stations and tear down (свёртывать/
свернуть) for relocation under a wide variety of condi-
tions.

AIR FORCE COMMUNICATIONS

At the beginning of the development of aviation, contact between the aircraft and the ground was on short wave (Короткие Волны (КВ)), or high frequency (HF). However, HF had several characteristics which made it a less than perfect means of communications for aircraft. For example, it depended on the condition and height of the ionospheric layer of the atmosphere for reflection of signals back to earth. This was complicated by the fact that this layer changes depending upon the time of day, solar activity and a number of other factors.

In organizing communications between the ground stations and aircraft, and between ground stations, all of these factors had to be taken into consideration in selecting the frequencies to be used at various times of the day. During contact between aircraft and ground station, the length of the radio link is constantly changing. Besides that, the users of this frequency range were constantly experiencing interference introduced by other radio stations, often distant from the point of reception, and by atmospheric interference. However, with the introduction of the gas turbine engine, aircraft were able to fly at higher altitudes. With this increase in altitude, it was possible to change to the very high frequency (VHF) (Ультракороткие Волны (УКВ)) range for control of aircraft movements.

Radio contact on VHF solved many of the problems encountered on HF: (1) VHF does not depend on the condition and height of the ionospheric layer of the atmosphere; (2) it is possible to use VHF day and night, winter and summer without changing frequency; (3) with VHF, there is almost no atmospheric interference; (4) VHF allows for receiving a high degree of directional reception and transmission; (5) VHF allows a radio station to use the power of the transmitter to decrease the interference for reception; and (6) VHF permits a simple and more compact antenna structure and other apparatus - especially important when installing it on an aircraft.

The electromagnetic energy of the VHF range is straight line or line-of-sight, and the distance of communications on VHF is practically dependent on line of sight between the sender and the receiver since there is little refraction, or curvature, of the signal over the earth's surface. Communications between an aircraft and the ground will depend on the height of the ground station's antenna and the height of the aircraft. (See Figures 32 & 33).

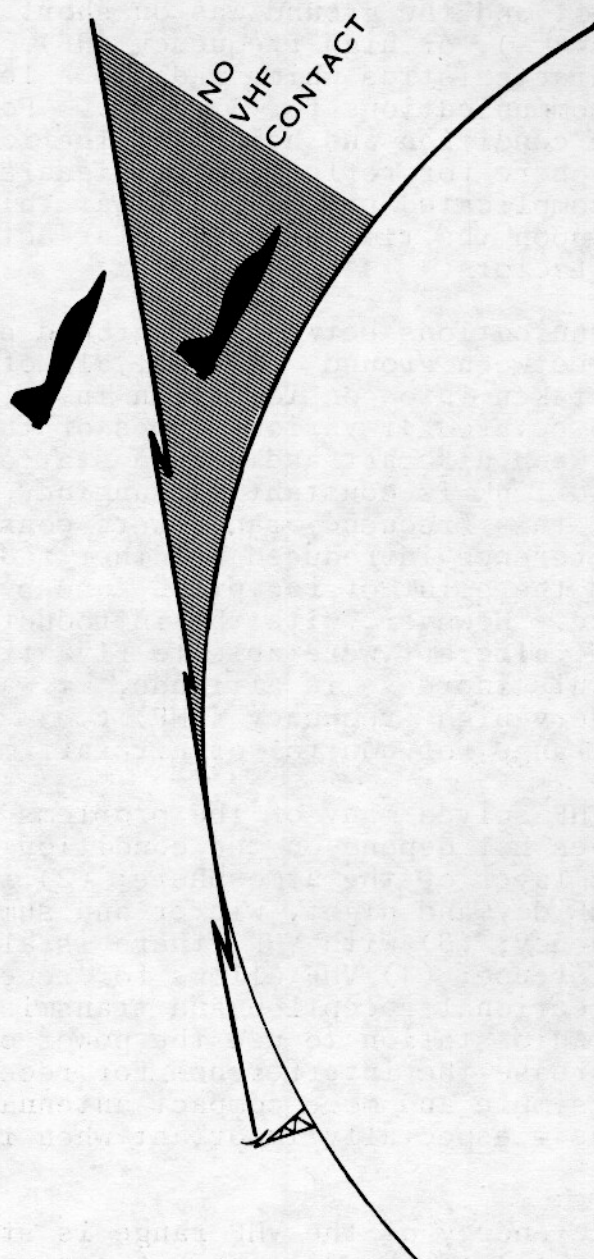
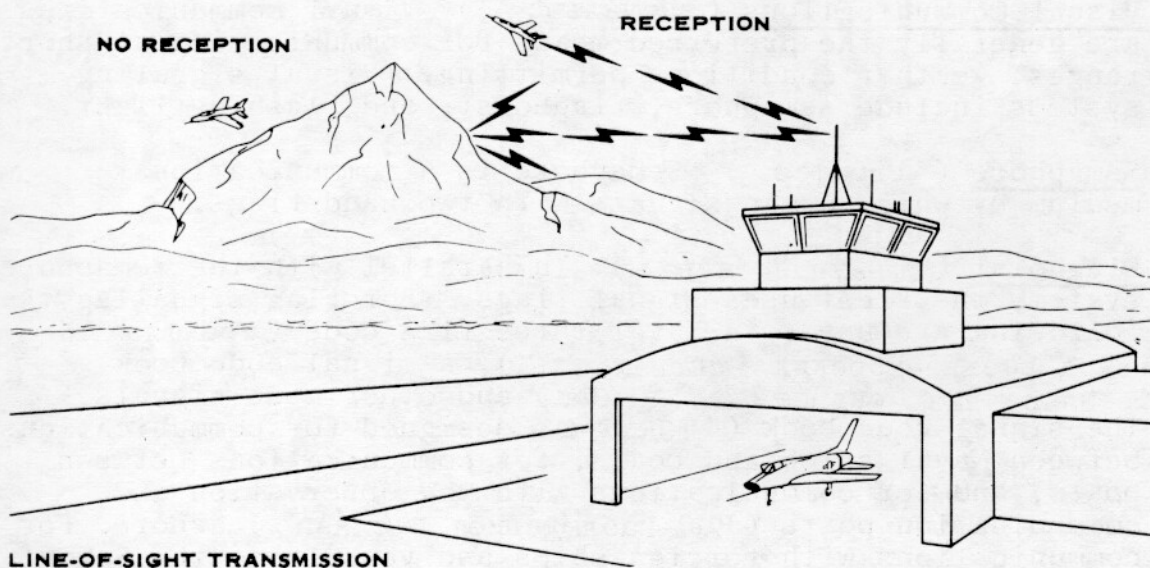


Figure 32

Piston aircraft fly at relatively low altitudes and, therefore, the distance of the radio link on VHF between them and the ground station is considerably reduced, and often communications can not be maintained for the entire flight to another airfield. For this reason, piston aircraft still use HF in addition to VHF. HF is also used by gas turbine aircraft when the distance between neighboring flight control points along the flight route can not be covered by VHF (for example, transoceanic flight).

The transition to high altitude gas turbine, and later jet, engine aircraft allowed basic flight directions to be carried out on VHF which sharply increased the quantity and clarity of communications. As a result of this, fighter/interceptor aircraft, which have a limited flight range, usually use VHF. On the other hand, tactical/light bombers, medium and heavy bombers and transports usually use both HF and VHF.



Anything between the aircraft and radio station will prevent UHF radio communication. Even a building between a parked aircraft and the control tower can prevent radio communication.

Figure 33

NAVAL COMMUNICATIONS

Fleet Broadcasts There are three ways in which radio traffic is sent to the fleet:

Broadcast
Intercept
Receipt

Broadcast and intercept are "do not answer" methods, while the receipt, as its name implies, requires a receipt from the addressee.

Almost all fleet traffic is handled by the broadcast method.

By the intercept method, a shore station transmits messages to another shore station which repeats them back. Ships intercept and copy all traffic.

Visual Communications (ВИЗУАЛЬНО) Visual communications are generally the preferred means for communicating at short ranges, weather conditions permitting. Visual signaling systems include semaphore, flaghoist, and flashing light.

Semaphore (семафор) Semaphore is a communications medium by which a man signals with two hand flags.

Flaghoist (флажный сигнал) In parallel with the semaphore system, the fleet uses signal flags. For flag signaling the following are used: A Naval three flag code (трехфлажный свод военно-морских сигналов), a signal code book (шлюпочная сигнальная книга) and other code signals. The signal code book (ШСК) was designed for communications between Naval ships and boats, for communications between boats, and for communications with the observation and communication posts (НИС-наблюдение и связи) ashore. For communications with foreign ships and vessels of the Soviet merchant fleet the international signal code (международный свод сигналов) is used.

These codes remarkably simplify and facilitate visual flag communications. For example, in order to send the phrase "You are standing into danger" (курс ведёт к опасности) using the signal code book it is necessary to raise only the flag "B" (Веди). The flag signal (флажный сигнал) can consist of one or several flag combinations. Signal combinations can be one flag, two flag, or three flag. (однофлажный, двухфлажный, трехфлажный)

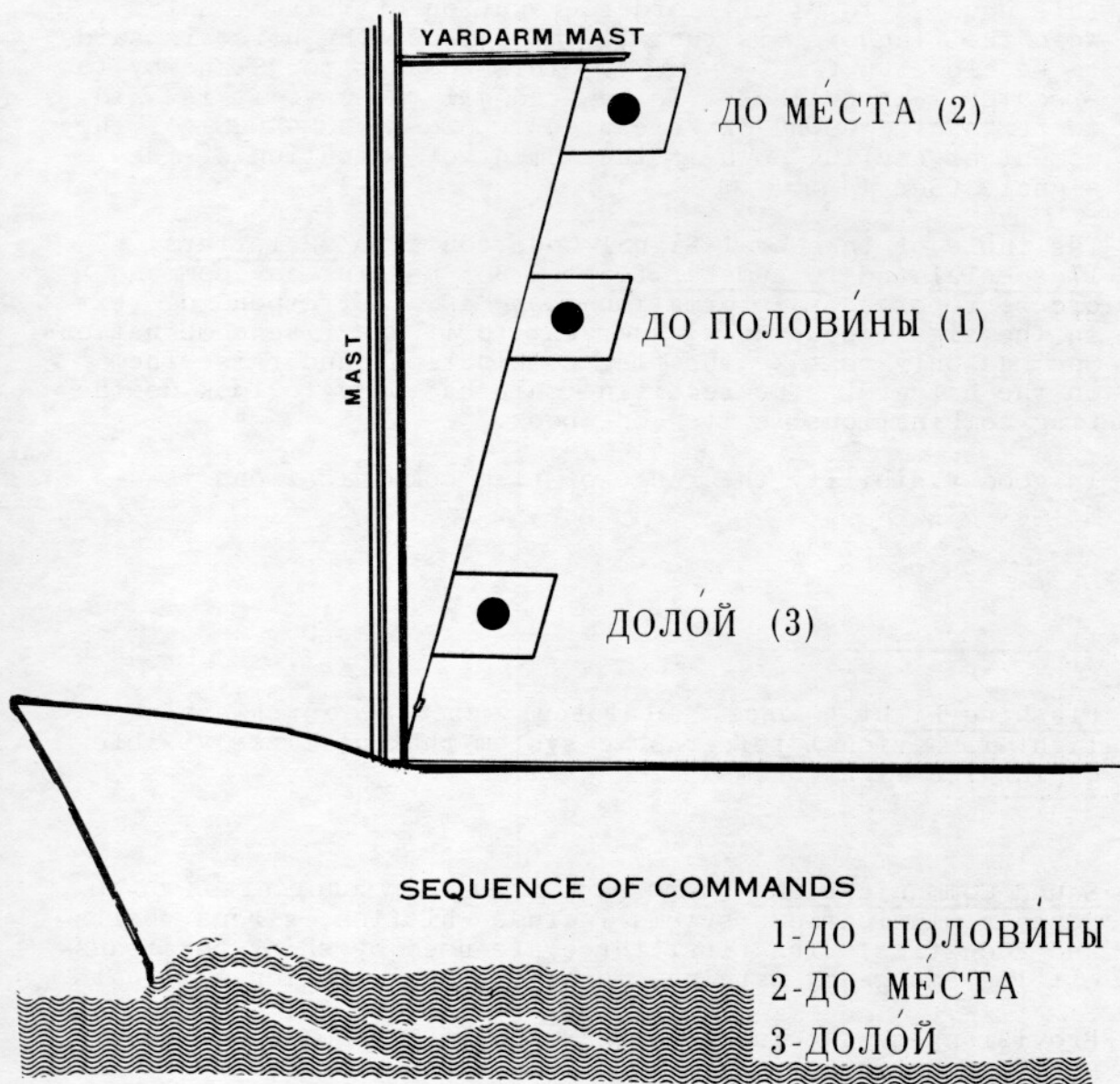


Figure 34

When a flaghoist is run only about 2/3 of the way, the hoist is said to be "dipped" or "at the dip" (до половины). This equates to "I will order execution of this signal". When the flaghoist is run all the way up, the hoist is said to be close up (до места). This equates to "Stand by to execute". When a hoist is lowered all the way, it is said to be "hailed down" or "executed" (долой, исполнил). The moment of hauling down is the moment of execution of the signal. (See Figure 34)

The table of the Naval Signal Code contains 32 letters, 17 special and 10 numeral flags. For passing any command, order, report, or information there is a corresponding text in the signal code book, and next to it the flag combinations. One has only to take the flag combinations and raise them on the halyard. The receiving ship has only to look up the flag combinations in its code book.

In good visibility the range of flag communications is 4-5 miles.

Flashing Light (свет, световой, прожектор) Flashing light is a visual telegraphic system that utilizes visible or infared light beams.

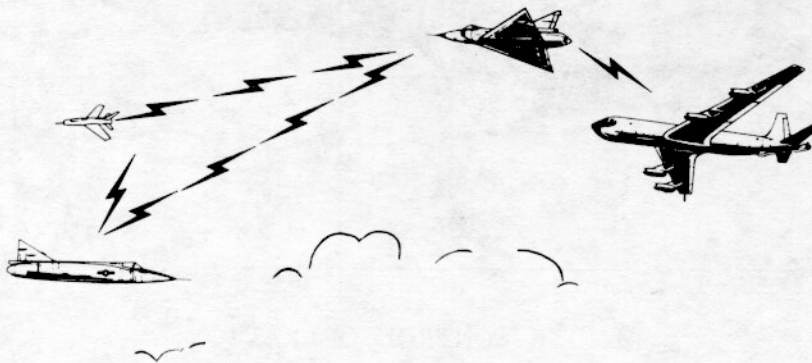
Sound Communications (звуковая связь, звукоподводная связь) Sound communications sytems include whistles, sirens, bells and acoustics. The first three are used by ships for transmitting emergency warning signals, and navigational signals.

Provision is made in many sonar equipments to permit their use for communications (звукоподводная связь).

TACTICAL RADIOTELEPHONE COMMUNICATIONS

Tactical radiotelephone communications in all branches of the Armed Forces, are characterized by short commands, signals and concise reports. Examples of tactical radiotelephone communications are the communications conducted between aircraft and between aircraft and ground controllers, communications between combat vehicles such as tanks, communications between ships, communications between various units during the conduct of combat operations or simulated combat operations in training. Tactical radiotelephone communications usually consist of stock phrases or formatted plaintext or encrypted exchanges. Many times instead of a radiotelephone operator the unit commander, vehicle or tank commander, or aircraft commander will operate the radioset when giving commands or receiving reports.

Since each branch's signal operating procedures and tactical use of radiotelephone are somewhat different and the tactical situations differ considerably among the branches and arms, the following simulated communications exercises will be specific in content.



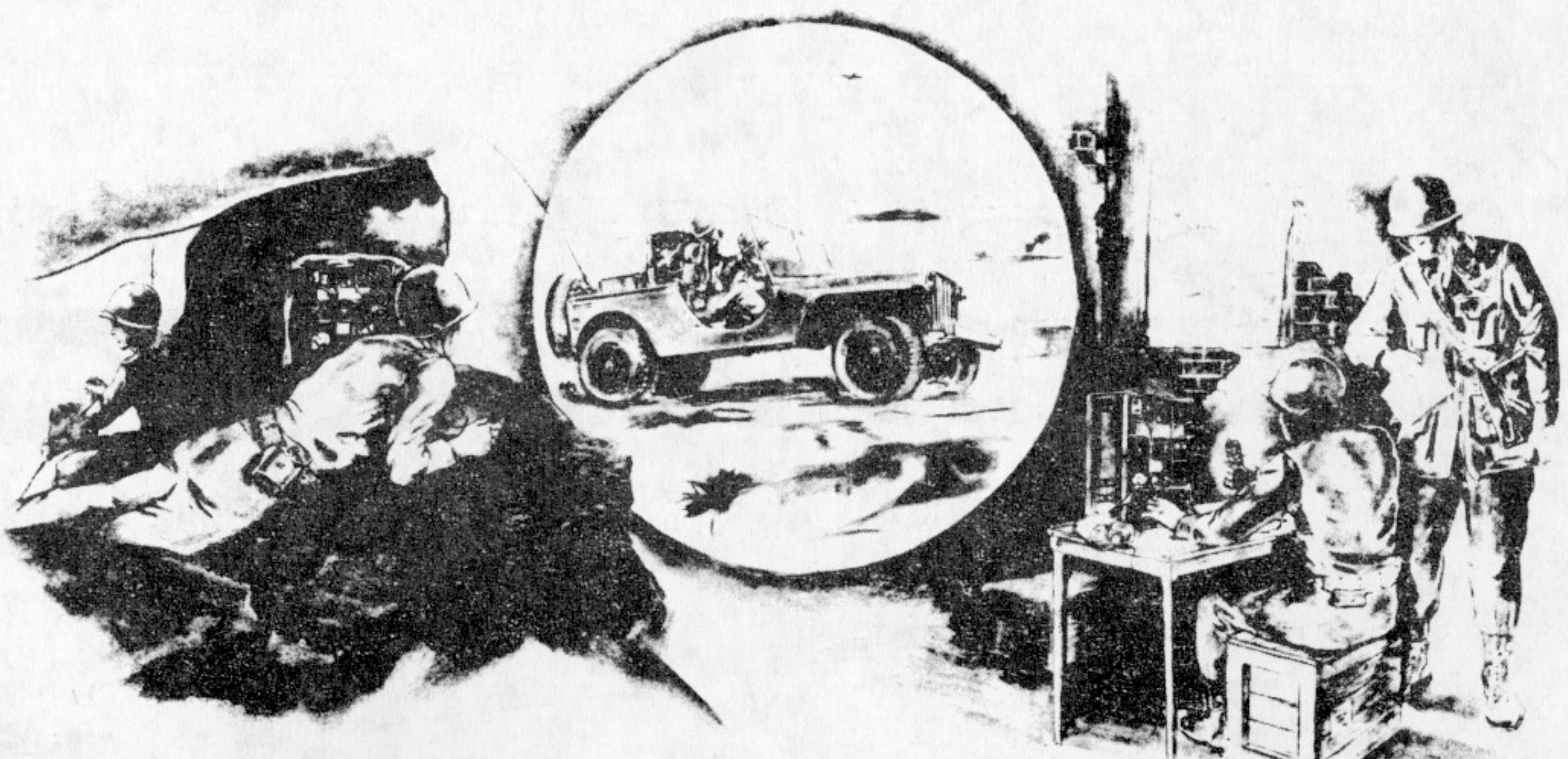
TACTICAL AIR FORCE COMMUNICATIONS

Figure 35



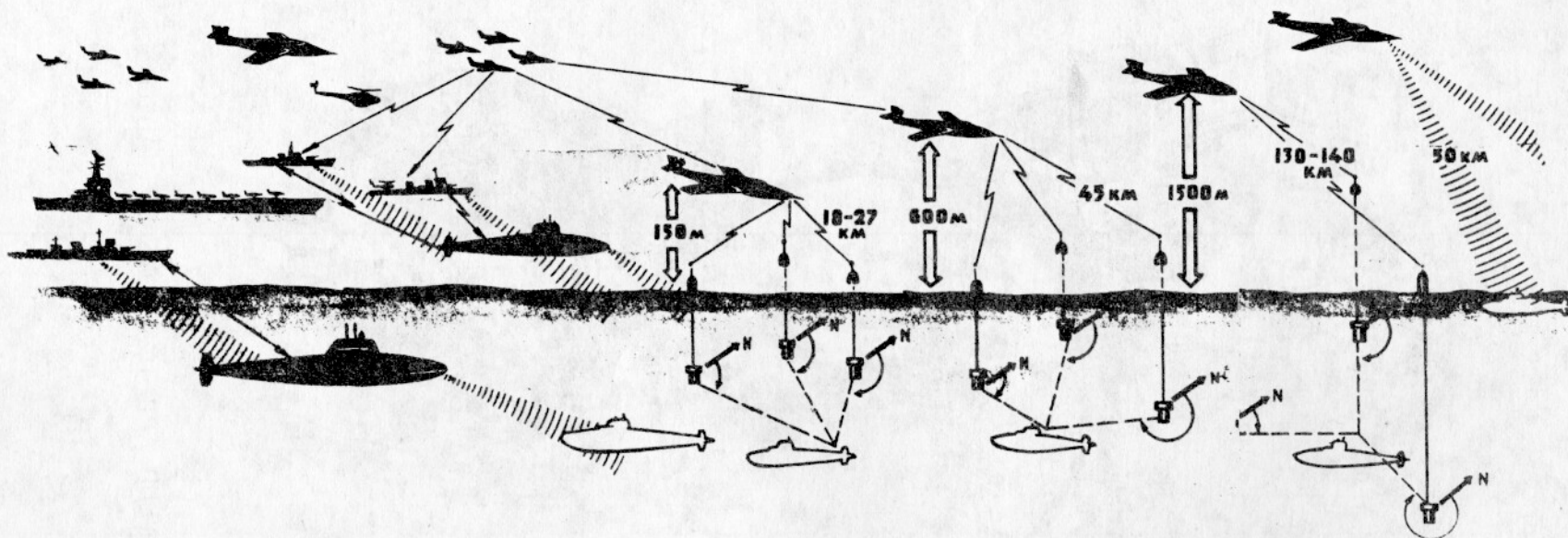
REMOTE CONTROL OPERATION

Figure 36



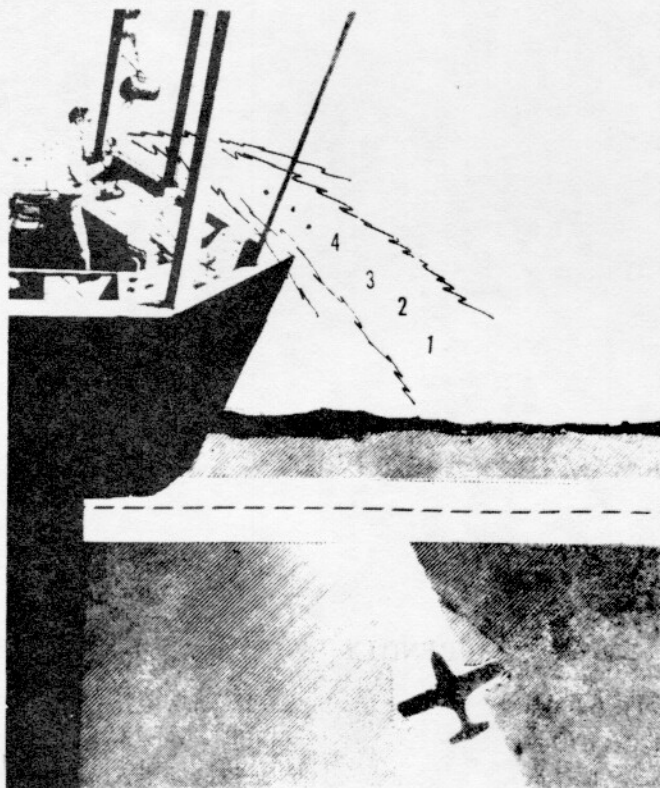
FIELD APPLICATIONS OF RADIO

Figure 37



NAVAL COMMUNICATIONS AND ELECTRONIC TRANSMISSION (SONAR/RADAR)

Figure 38



CONTROLLER GIVING A COUNT

AIR FORCE COMMUNICATIONS

Figure 39

APPENDIX A

Диапазо́н радиочасто́т				Диапазо́н радиово́лн		
наименова́ние диапазо́на			границы диапазо́на	наименова́ние диапазо́на		границы диапазо́на
основно́й терми́н	параллеле́льный терми́н			основно́й терми́н	параллеле́льный терми́н	
	по́лное наименова́ние	*				
1-й диапазо́н частото́т	Кра́йне низкие частото́ты	КНЧ	3 -30 гц	1-й диапазо́н волн	Декамега́метровые во́лны	100 -10 Мм
2-й диапазо́н частото́т	Сверхни́зкие частото́ты	СНЧ	30-300гц	2-й диапазо́н волн	Мега́метровые во́лны	10 -1 Мм
3-й диапазо́н частото́т	Инфрани́зкие частото́ты	ИНЧ	0,3 -3 кгц	3-й диапазо́н волн	Гектокиломе́тровые во́лны	1000-100км
4-й диапазо́н частото́т	Очень ни́зкие частото́ты	ОНЧ	3 -30 кгц	4-й диапазо́н волн	Мириа́метровые во́лны	100 -10 км
5-й диапазо́н частото́т	Ни́зкие частото́ты	НЧ	30-300кгц	5-й диапазо́н волн	Киломе́тровые во́лны	10 -1 км
6-й диапазо́н частото́т	Сре́дние частото́ты	СЧ	0,3 -3 Мгц	6-й диапазо́н волн	Гектоме́тровые во́лны	1 -0,1км
7-й диапазо́н частото́т	Высо́кие частото́ты	ВЧ	3 -30 Мгц	7-й диапазо́н волн	Декаме́тровые во́лны	100 -10 м
8-й диапазо́н частото́т	Очень высо́кие частото́ты	ОВЧ	30-300Мгц	8-й диапазо́н волн	Ме́тровые во́лны	10 -1 м
9-й диапазо́н частото́т	Ультравысо́кие частото́ты	УВЧ	0,3 -3 Ггц	9-й диапазо́н волн	Дециме́тровые во́лны	1 -0,1м
10-й диапазо́н частото́т	Сверхвысо́кие частото́ты	СВЧ	3 -30 Ггц	10-й диапазо́н волн	Сантима́етровые во́лны	10 -1 см
11-й диапазо́н частото́т	Кра́йне высо́кие частото́ты	КВЧ	30-300Ггц	11-й диапазо́н волн	Миллиме́тровые во́лны	10 -1 мм
12-й диапазо́н частото́т	Гипервысо́кие частото́ты	ГВЧ	0,3 -3 Тгц	12-й диапазо́н волн	Децимиллиме́тровые во́лны	1 -0,1мм

Примечания: 1. Диапазоны радиочастот включают наибольшую частоту и исключают наименьшую.
2. Диапазоны радиоволн включают наименьшую длину волны и исключают наибольшую.

CLASSIFICATION OF RADIO FREQUENCIES A

Radio Frequency Spectrum				
Band Designator			Band Limits	E
Band Number	Complete Designator	Abrv.		
1	- - -	- -	3 -30 Hz	
2	Extremely Low Frequency	ELF	30-300 Hz	
3	Voice Frequency	VF	0.3 -3 kHz	
4	Very Low Frequency	VLF	3 -30 kHz	
5	Low Frequency	LF	30-300 kHz	
6	Medium Frequency	MF	0.3 -3 MHz	
7	High Frequency	HF	3 -30 MHz	
8	Very High Frequency	VHF	30-300 MHz	
9	Ultra High Frequency	UHF	0.3 -3 GHz	
10	Super High Frequency	SHF	3 -30 GHz	
11	Extremely High Frequency	EHF	30-300 GHz	
12	- - -	- -	0.3 -3 THz	

Гц - герц	Hz - hertz
кГц - килогерц	kHz - kilohertz
МГц - Меггерц	MHz - Megahertz
ГГц - Гиггерц	GHz - Gigahertz
ТГц - Терагерц	THz - Terahertz
Мм - Мегаметр	Mm - Megameter
м - метр	m - meter
см - сантиметр	cm - centimeter
мм - миллиметр	mm - millimeter

ATION OF RADIO FREQUENCIES AND RADIO WAVES

		Radio Wave Spectrum			
		Band Limits	Band Designator		Band Limits
Abrv.			Band Number	Metric Designator	
- -	3 -30 Hz	1	Decamegametric Waves	100 -10 Mm	
ELF	30-300 Hz	2	Megametric Waves	10 -1 Mm	
VF	0.3 -3 kHz	3	Hectokilometric Waves	1000-100Km	
VLF	3 -30 kHz	4	Myriametric Waves	100 -10 Km	
LF	30-300 kHz	5	Kilometric Waves	10 -1 Km	
MF	0.3 -3 MHz	6	Hectometric Waves	1 -0.1Km	
HF	3 -30 MHz	7	Decametric Waves	100 -10 m	
VHF	30-300 MHz	8	Metric Waves	10 -1 m	
UHF	0.3 -3 GHz	9	Decimetric Waves	1 -0.1m	
SHF	3 -30 GHz	10	Centimetric Waves	10 -1 cm	
EHF	30-300 GHz	11	Millimetric Waves	10 -1 mm	
- -	0.3 -3 THz	12	Decimillimetric Waves	1 -0.1mm	

герц Hz - hertz
 килогерц kHz - kilohertz
 Меггерц MHz - Megahertz
 Гиггерц GHz - Gigahertz
 Терагерц THz - Terahertz
 Мегаметр Mm - Megameter
 метр m - meter
 сантиметр cm - centimeter
 миллиметр mm - millimeter

APPENDIX B

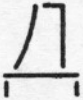
Band	Range (Note)		Power Required	Antenna Length
	Day	Night		
VLF	Long	Long	Extremely High	Very Long
LF	Long	Long	Very High	Long
MF	Medium	Long	High to Medium	Long
HF (3-10 MHz)	Short	Medium to Long	Medium	Medium
HF (10-30 MHz)	Long	Short	Low	Short
VHF	Short	Short	Low	Very Short
UHF	Line-of-Sight	Short	Low	Very Short
SHF	Line-of-Sight	----	Low	Very Short
EHF	Line-of-Sight	----	Low	Very Short
UHF & SHF Troposcatter	Short	Short	High	Very Short

NOTE: Long Range	Over 1,500 miles
Medium Range	200 to 1,500 miles
Short Range	Under 200 miles
Line-of-Sight	Under 50 miles

APPENDIX C

RUSSIAN ALPHABET IN BLOCK LETTERS

In the following examples of block printed cyrillic characters, the breaks between strokes are shown for instructional purposes only. In actuality, these breaks are not seen.

Example:  will be 

А Б В Г Д Е Ж

З И Й К Л М Н

О П Р С Т У Ф Х

Ц Ч Ш Щ Ъ Ы Ь

Э Ю Я

APPENDIX D

RU	Translit. TECH NOM		Phonetic Alphabet	RU	Translit. TECH NOM		Phonetic Alphabet
А	А	А	А́нна	Р	Р	Р	Рома́н
Б	В	В	Бори́с	С	С	С	Семё́н
В	W	V	Васи́лий (Влади́мир)	Т	Т	Т	Татья́на
Г	G	G	Григо́рий	У	U	U	Улья́на
Д	D	D	Дми́трий	Ф	F	F	Фёдор
Е, ё	E	E	Еле́на	Х	H	Kh	Харито́н
Ж	V	Zh	Же́ня	Ц	C	Ts	Ца́пля
З	Z	Z	Зинаи́да	Ч	;	Ch	Челове́к
И	I	I	Ива́н	Ш	:	Sh	Шу́ра
Й	J	J	(Ива́н)krátkiy	Щ	Q	Shch	Щу́ка
К	K	K	Константи́н	Ъ	'	"	Твёрдый знак
Л	L	L	Леони́д	Ы	Y	Y	Еры́
М	M	M	Михаи́л	Ь	X	'	(Мя́гкий) знак
Н	N	N	Никола́й	Э	?	Eh	Э́хо (Э обо́ротное)
О	O	O	О́льга	Ю	&	Yu	Ю́рий (Ю́ля)
П	P	P	Па́вел (Пе́тр)	Я	"	Ya	Я́ков

Note: In cases where the nominal transliteration of a letter requires more than one English letter, ONLY the FIRST LETTER is CAPITALIZED.

Chart 1

Soviet Navy, Phonetic Equivalents for Signal Flags,
Условные Названия флагов Военно-Морского Свода Сигналов

RU	Phonetic	RU	Phonetic	RU	Phonetic
А	Аз	Л	Люди	Ц	Цепочка
Б	Буки	М	Мыслете	Ч	Червь
В	Веди	Н	Наш	Ш	Ша (Шапка)
Г	Глаголь	О	Он	Щ	Шука
Д	Добро	П	Покой	Ъ	Твёрдый Знак
Е	Есть	Р	Рцы	Ы	Еры
Ж	Живете	С	Слово	Ь	Мягкий Знак
З	Земля	Т	Твёрдо	Э	Эхо (Э Обратное)
И	Иже	У	Ухо	Ю	Юра (Юла)
Й	И Краткий (Иван Краткий)	Ф	Ферт	Я	Яков (Ясно)
К	Како	Х	Ха (Харитон)		
Additional Naval Flags					
1-ый Дополнительный			Воздушный		
2-ой Дополнительный			Норд		
3-ий Дополнительный			Зюйд		
4-ый Дополнительный			Ост		
Гюйс			Вест		
Газ			Вопросительный		
Дым			Ответный		
Телеграфный			Исполнительный		
Шлюпочный					

Chart 2

APPENDIX E

LETTER SUBSTITUTION LIST

The purpose of this list is to aide students in finding words in the dictionary. Due to varying stresses and pronunciation, it is possible to confuse one letter for another. If a word can not be found in the dictionary under one spelling, try substituting letters using the following list as a guide.

Substitutions are given in the order of most frequent errors.

Letter	Possible Substitutions	Letter	Possible Substitutions
А	Я, О	Р	Л, В
Б	П	С	З, Ж, Ц, Ш
В	Ф, Р, Л	Т	Д
Г	Х, К, В	У	Ю, В, О
Д	Т	Ф	В
Е, Ё	И, Э, О, Я, Й	Х	К, Г
Ж	З, Ш, С	Ц	Ч, С
З	С, Ж, Ц	Ч	Ц
И	Ы, Е	Ш	Щ, Ж, Ч, С
Й	И	Щ	Ш, Ч
К	Г, Х	*	DOES NOT APPLY
Л	Р, В	Ы	И, Ю, О
М	Н	*	DOES NOT APPLY
Н	М	Э	Е
О	А, У, Ё	Ю	У, Ы
П	Б, Ф	Я	А, И, Е

VOCABULARY

абоне́нт	-subscriber
а́зимуты на корреспонде́нтов	-azimuths to the correspondents
аккумулято́р	-storage battery
анте́нное устро́йство	-antenna system
аппара́тная маши́на свя́зи	-communications van
аппара́тный журна́л радиостанции	-radio station log
блок пита́ния	-power supply
большо́й разде́л	-double slash (//)
борто́вая радиостан́ция	-on board radio station
визуа́льно	-visual
гарниту́ра	-headsets
гла́вная радиостан́ция	-control station
диапазо́н радиово́лн	-wave bands
диапазо́н радиочасто́т	-frequency band
длина́ волн	-wave length
квита́нция	-receipt
ключи́ к перегово́рной таблице	-keys to the procedural table
коммута́тор	-switchboard
коротковолно́вая радиосвя́зь	-shortwave radio
ли́ния переда́чи или фи́дер	-transmission lines
нагру́зка	-radio traffic, work load
напра́вленная анте́нна	-directional antenna

начальник радиостанции	-station chief
начальник смены	-shift chief
начальник экипажа	-crew chief
ненаправленная антенна	-omnidirectional antenna
обучение	-training
оперативный	-operative
передатчик	-transmitter
переменный ток	-alternating current (AC)
позывной	-callsigns
поляризация	-polarization
постоянный ток	-direct current (DC)
приём	-over, reception
приёмник	-receiver
приёмопередатчик	-transceiver
проверка связи	-communications check
провод	-"landline"
проводная связь	-wire communications
радиоаппаратура	-radio equipment
радиограмма	-radio message
радиоданные	-signal operating instructions (SOI)
радионаправление	-radio link
радиообмен	-radio traffic
радиопароли	-radio authenticators
радиосвязь	-radio communications
радиосеть	-radio net

радиостáнция	-radio station
развѣрты́вать/разверну́ть	-set up
раздѣл	-slash mark (/)
свѣрты́вать/сверну́ть	-to tear down
семафóр	-semaphore
сѣ́рия	-precedence
служе́бный	-service
указáние о поряд́ке рабóты радиостáнции	-instructions on radio station operating procedures
у́зел связи	-communications center
ф́лажный сигнал	-flaghoist
циркуля́рный вызов	-collective callsign

